Wills Maclachlan

Sixth Annual Report

OF THE

HYDRO-ELECTRIC POWER COMMISSION

OF THE

PROVINCE OF ONTARIO

FOR YEAR ENDED OCTOBER 31st

1913

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1914

Printed by
WILLIAM BRIGGS
29-37 Richmond Street West
TORONTO

To His Honour Sir John Morison Gibson, K.C.M.G.,
Lieutenant-Governor of Ontario.

May it Please Your Honour:

The undersigned has the honour to present to Your Honour the Sixth Annual Report of the Hydro-Electric Power Commission of Ontario for the fiscal year ending October 31st, **1913.**

Respectfully submitted,

ADAM BECK,
Chairman.

TORONTO, **February 15th, 1913**

HONORABLE ADAM BECK,

Chairman, Hydro-Electric Power Commission,

Toronto, Ont.

SIR,—I have the honour to transmit herewith the Sixth Annual Report of the Hydro-Electric Power Commission of Ontario for the fiscal year ending October 31st, 1913.

I have the honour to be,

Sir,

Your obedient servant,

W. W. POPE,

Secretary.

PREFACE

The following report gives a short summary of the work performed during the fiscal year. Attention is particularly directed to the new powers vested in the Commission by the Hydro-Electric Railway Act of 1913, and the Act of 1912, respecting the organization of inspection departments.

During this period contracts were entered into with the municipalities of Windsor and Walkerville, resulting in the extension of the Niagara System and the construction of 105 miles of 110,000 volts transmission lines with the necessary transformer stations. Also, owing to the rapid increase in the load in the Niagara district, increased capacity has been required at the Niagara, Dundas, London, St. Thomas and Toronto stations. Details of the various extensions made to the Niagara system will be found in the body of the report.

Early in the year contracts for power were entered into with the municipalities of the Beaverton-Cannington district. The most economical source of supply was found to be a development at Wasdell's Falls on the Severn River. This was a new departure on the part of the Commission, but after authorization by the government contracts were awarded and work has progressed favourably.

A large amount of engineering work has also been done in connection with a number of municipal underground systems and eleven municipalities have placed the construction work on their systems under the supervision of the Commission.

In addition to the above a great deal of information has been collected during the year on the stream-flow and storage possibilities of various rivers in the Province. The result of this work is shown by the Hydraulic Report, Chapter Six. This report is considerably larger than that of the previous year, and gives information in great detail.

Many demonstrations have also been given during the year in connection with the use of electrical energy on the farm, and considerable interest has been shown in this work.

The organization of electrical inspection departments has further engaged the active attention of the Commission, and many municipalities have organized inspection departments and appointed inspectors.

During the year many municipalities have acted upon the authority vested in the Commission and forwarded resolutions, requesting estimates and reports in relation to electric radial railways. A report has already been issued for the district north-east of Toronto.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

HON. ADAM BECK, London, Chairman.

HON. JOHN S. HENDRIE, C.V.O., Hamilton, Commissioner.

W. K. McNAUGHT, M.P.P., Toronto, Commissioner.

W. W. POPE, Secretary.

F. A. GABY, Chief Engineer.

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CHAPTER I

LEGAL PROCEEDINGS

ACTS

The following Act with respect to the Public construction and operation of Electric Railways was passed by the Legislature of the Province of Ontario during the Session of 1913.

This Act invests the Commission with powers to inquire and report on the cost of constructing and operating Electric Railways in any locality in which Electric Power or energy may be supplied by the Commission, and also authorizes any Municipal Corporation to enter into an agreement with the Commission for the construction and operation of Electric Railways or for the construction by the Commission and operation by the Corporations, the Municipalities to finance the cost of the same.

The Hydro-Electric Railway Act

3 Geo. V. Chap. 38.

An Act respecting the Public Construction and Operation of Electric Railways.

Assented to May 6th, 1913.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. This Act may be cited as *The Hydro-Electric Railway Act.* — Short title.

2. In this Act, — Interpretation.

"Commission" shall mean The Hydro-Electric Power Commission of Ontario. — "Commission."

"Corporation" shall mean a municipal corporation, other than the Municipal corporation of a county. — "Corporation."

3. Whenever required by the Lieutenant-Governor in Council so to do The Commission may enquire into, examine, investigate and report upon, — Commission to enquire and report

(*a*) The cost of constructing and operating an electric railway, in any locality in which electrical power or energy may be supplied by The Commission under *The Power Commission Act;*

(*b*) The municipalities, the inhabitants of which will be served by such railway;

(*c*) The population of each of such municipalities as shown by the last enumeration thereof by the assessors;

(*d*) An estimate of the probable revenue from the railway;

(*e*) The practicability of the undertaking and its economic value to the locality to be served by it.

Agreement with corporations for construction of line.

4.—(1) A corporation or two or more corporations may if authorized by the Lieutenant-Governor in Council so to do enter into an agreement with the Commission for the construction, equipment and operation of an electric railway to be operated by electrical power or energy supplied by the Commission.

Matters which may be provided for in agreement

(2) The agreement may provide for,

(*a*) The location of the line of the railway;

(*b*) The character of the equipment and service to be furnished and the maximum tolls or fares to be chargeable thereon.

(*c*) The proportion in which the cost of construction, equipment, maintenance and operation of the railway shall be borne by each of the corporations interested.

(*d*) The issuing of debentures of the corporation or of each of the corporations for raising the amount of such cost.

(*e*) The proportion of the revenue from such railway to be paid annually by the Commission to each corporation after deducting the charges hereinafter mentioned.

(*f*) The construction of the railway upon any right of way acquired by the Commission for the transmission of electrical power or energy under *The Power Commission Act* and the amount chargeable to the railway by way of rental or otherwise for the use of such right of way.

Agreement for construction and operation by corporation.

(3) Instead of providing for the construction and operation of the Railway by the Commission, the agreement may provide for its construction by the Commission and for its operation by the Corporation, or for its construction and operation by the corporation or corporations,

and in either case for the supply by the Commission of the electrical power requisite for the operation of the railway on such terms and conditions as may be agreed on between the corporation or corporations and the Commission.

(4) Where the railway is to be constructed and operated by the corporation or corporations, the Commission may agree with them to permit the railway to be constructed upon the right of way or other lands of the Commission on such terms and conditions as may be agreed on. Construction on right of way of Commission.

(5) The agreement shall not come into effect until it has been sanctioned by the Lieutenant-Governor in Council and has been approved by by-law passed with the assent of the municipal electors of each municipality. Approval of Lieutenant-Governor in Council.

5.—(1) The council of every corporation entering into an agreement with the Commission under this Act shall annually raise and pay over to the Commission such sums as may be required by it in the construction, equipment, maintenance and operation of the railway including the costs of the supply of electrical power or energy to the extent and in the proportions fixed by the agreement and for that purpose may issue debentures of the corporation payable in not more than forty years from the date of the issue thereof. Annual payments by municipalities to defray cost.

(2) It shall not be necessary to obtain the assent of the electors to the passing of any by-law for incurring a debt under this section. Assent of electors not necessary.

6. Where the agreement provides for the construction and operation or for the operation of the railway by a corporation or by two or more corporations it shall also provide for the management of the railway and its operation by a Public Utilities Commission to be approved by the Lieutenant-Governor in Council and it shall provide as to the mode of appointing the members of the commission and for the proportions in which each corporation shall contribute to the cost of its construction, maintenance and operation and for the proportion in which each of them shall share in the income, revenue and profits derived from the operation of the railway, and such corporation or corporations or commission shall have the right to construct and operate the railway notwithstanding that it does not lie wholly within one or more of the municipalities, the corporations of which may have entered into the agreement. Construction and operation by Public Utilities Commission.

7. A Public Utilities Commission appointed under the provisions of the next preceding section shall have all the powers and perform all the duties of a Public Utilities Commission appointed under *The Public Utilities Act*. Powers and duties of Public Utilities Commission.

8. Subject to the provisions of section 5, where an agreement has been entered into under section 4 the Commission may construct, complete, equip, maintain, and operate the railway therein provided for, and for that purpose shall have and may exercise the powers of a company Powers of Commission as to construction and operation.

incorporated by Special Act for the construction of such a railway under the provisions of *The Ontario Railway Act,* so far as the same are applicable.

Taking lands.

9. Where land is required for any of the purposes for which land may be acquired or expropriated under *The Ontario Railway Act,* the Commission in respect thereof shall have the powers and shall proceed in the manner provided by *The Public Works Act,* where the Minister of Public Works takes land or property for the use of Ontario, and the provisions of the said Act, shall, *mutatis mutandis* apply.

Application of revenue by Commission.

10. The Commission shall apply the revenue derived from the operation of the railway to the payment of working expenses of the railway and after payment of the same shall annually pay over the balance, if any, to the corporations, parties to the agreement in the proportions fixed thereby.

Application of profits by corporation.

11. All sums received by the corporation or corporations shall be applied in the first place in the payment of the principal and interest of any debt incurred under the authority of this Act in the manner prescribed by the Commission.

Certain sections of Railway Act not to apply.

12. Sections 68 to 97 of *The Ontario Railway Act* shall not apply to the Commission or to any railway constructed or operated by it.

Application of ss. 8-12.

13. Sections 8 to 12 shall apply only where the agreement provides for the construction of the railway by the Commission.

Actions not to be brought against Commission without fiat.

14. No action or prosecution shall be brought against the Commission or any member thereof or any of its officers under *The Ontario Railway Act* without the consent of the Attorney General of Ontario.

No liability for errors in estimates.

15. Neither the Province nor the Commission nor any member thereof shall incur any liability by reason of any error or omission in any estimates, plans or specifications prepared or furnished by the Commission.

Works vested in Commission.

16. Every railway and the works, property and effects held and used in connection therewith, constructed, acquired, operated and maintained by the Commission under this Act shall be vested in the Commission in trust for the Corporations parties to the agreement for the construction and operation of the railway.

The following Act was passed by the Legislature last Session to validate certain By-laws passed and contracts made with the various municipalities.

The Power Commission Act, 1913

3 Geo. V., Chap 12.

An Act to validate certain By-laws passed and contracts made pursuant to the Power Commission Act and amendments thereto respecting the Transmission of Electrical Power to Municipalities.

Assented to May 6th, 1913.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

Short title.

1. This Act may be cited as *The Power Commission Act*, 1913.

Certain corporations added as parties to contract with Commission.

2. The Municipal Corporation of the City of Brantford; The Municipal Corporation of the City of Windsor, The Municipal Corporation of the Town of Goderich, the Municipal Corporation of the Town of Paris, the Municipal Corporation of the Town of Milton, the Municipal Corporation of the Town of Clinton, the Municipal Corporation of the Village of Elmira, the Municipal Corporation of the Village of Hagersville, The Municipal Corporation of the Village of Georgetown, The Municipal Corporation of the Village of Acton, The Municipal Corporation of the Village of Caledonia and the Municipal Corporation of the Police Village of Rockwood, are added as Parties of the Second Part to the contract set out in Schedule "A" to *The Power Commission Act*, 1909, as varied and confirmed by the said Act, and as further varied and confirmed by the Act passed in the tenth year of the reign of His late Majesty King Edward the Seventh, chaptered 16, as amended by the Act passed in the first year of the reign of His Majesty King George the Fifth, chaptered 16, and as amended by the Act passed in the second year of the reign of His Majesty, King George the Fifth, and as amended by this Act, and the said contracts shall be binding upon the parties thereto respectively,

as to the City of Brantford, from the 4th day of November, 1912;
as to the City of Windsor, from the 20th day of December, 1912;
as to the Town of Goderich, from the 22nd day of January, 1913;
as to the Town of Paris, from the 9th day of November, 1912;
as to the Town of Milton, from the 5th day of November, 1912;
as to the Town of Clinton, from the 7th day of April, 1913;
as to the Village of Elmira, from the 28th day of February, 1913;
as to the Village of Hagersville, from the 11th day of November, 1912;
as to the Village of Georgetown from the 23rd day of December, 1912;
as to the Village of Acton, from the 30th day of April, 1912;
as to the Village of Caledonia, from the 26th day of July, 1912;
as to the Police Village of Rockwood, from the 23rd day of January, 1913.

Contract amended.

3. The names of the said Municipal Corporations are added to Schedule "B" of the said contract, and such Schedule shall be read as containing the particulars set out in Schedule "A" to this Act.

Contracts with certain municipalities confirmed.

4. The contracts set out as Schedules "A," "B," "C," "D," "E," "F," "G," "H," "I" and "J" hereto, between the Hydro-Electric Power Commission of Ontario and the Corporations of Welland, Port Dalhousie, Midland, Penetanguishene, Barrie, Coldwater, Stayner, Elmvale, Collingwood and Peterborough, are hereby confirmed and declared to be legal, valid and binding upon the parties thereto respectively, and shall not be open to question upon any grounds whatsoever, notwithstanding the requirements of *The Power Commission Act*, or the amendments thereto or any other statute.

By-laws confirmed.

5. By-laws Nos. 1216 and 1217, of the Corporation of the City of Brantford;

By-law No. 7, of 1913, of the Corporation of the Town of Goderich;

By-law No. 465, of the Corporation of the Town of Milton;

By-law No. 232, of the Corporation of the Village of Elmira;

By-law No. 178, of the Corporation of the Village of Hagersville;

By-law No. 351, of the Corporation of the Village of Georgetown;

By-law No. 449, of the Corporation of the Village of Acton;

By-laws Nos. 143 and 147, of the Corporation of the Village of Caledonia;

By-law No. 3, of the Corporation of the Police Village of Rockwood;

By-laws Nos. 432 and 460, of the Corporation of the Town of Welland;

By-law No. 321, of the Corporation of the Village of Port Dalhousie;

By-law No. 772, of the Corporation of the Town of Midland;

By-laws Nos. 447 and 448, of the Corporation of the Town of Penetanguishene;

By-law No. 771, of the Corporation of the Town of Barrie;

By-laws Nos. 33 and 34, of the Corporation of the Village of Coldwater;

By-law No. 485, of the Corporation of the Town of Stayner.

By-laws Nos. 662 and 663, of the Corporation of the Township of Flos;

By-laws Nos. 783 and 795, of the Corporation of the Town of Collingwood;

By-laws Nos. 1704 and 1713, of the Corporation of the City of Peterborough;

By-laws Nos. 346 and 350, of the Corporation of the Town of North Bay;

By-law No. 11 of the Township of Eramosa passed on the 13th day of January, 1913

are confirmed and declared to be legal, valid and binding upon such corporations and the ratepayers thereof, respectively, and shall not be open to question upon any ground whatsoever, notwithstanding the requirements of *The Power Commission Act,* or the amendments thereto or of any other Statute.

6. By-law No. 1353, of the Corporation of the City of Windsor, passed on the 4th day of July, 1910, to provide for the issue of debentures to the extent of one hundred thousand dollars for the cost of a plant to distribute electric power, and By-law No. 568, of the Corporation of the Town of Paris to authorize the issue of debentures to the extent of twenty-five thousand dollars for the purpose of extending the electric system of the said Town, and By-law No. 541, of the said Corporation, of the Town of Paris, are hereby confirmed and declared to be legal, valid and binding, notwithstanding any defect in substance or form therein, or any irregularity in the manner of passing the same, and the debentures issued, as provided by the said By-laws, shall be legal and valid and binding upon the said Corporations respectively, and the said ratepayers thereof.

By-laws of Windsor and Paris confirmed.

7. By-law Number 715 of the Municipal Corporation of Dundas, appointing a Water, Light and Power Commission;

By-laws, 715 Dundas, 1044 Galt, 714 Ingersoll, confirmed.

By-law Number 1044 of the Municipal Corporation of the Town of Galt, appointing a Water, Light and Power Commission; and

By-law Number 714 of the Municipal Corporation of the Town of Ingersoll, appointing a Water, Light and Power Commission,

are hereby confirmed and declared to be legal, valid and binding as from the respective dates of the passing thereof.

SCHEDULE A.

Additions to Schedule B, to the Contract set out in Schedule A to 9 Edw. VII., c. 19.

Name of Municipal Corporation.	Maximum price of power at Niagara Falls.	No. of Volts.	Quantity of Power applied for in horse-power.	Estimate maximum cost of power ready for distribution in municipality.	Estimate proportionate part of cost to construct transmission line, transformer stations and works for nominally 30,000 h.p., with total capacity of 60,000 h.p.	Estimate of proportionate part of line loss and of part cost to operate, maintain, repair, renew and insure transmission line, transformer stations and works for nominally 30,000 h.p., with total capacity of 60,000 h.p.
Brantford			1,200	19 50	107,700	6,353
Windsor			2,500	38 00	1,227,800	25,896
Goderich			700	37 00	151,690	10,802
Paris			600	21 00	62,928	3,551
Milton			700	28 00	116,963	6,516
Clinton			300	41 00	94.470	4.105
Elmira			200	38 00	49,180	2,948
Hagersville			150	33 21	32,868	1,725
Georgetown			200	36 00	45,214	2,778
Acton			200	36 00	43,434	2,801
Caledonia			25	29 10	3,515	268
Rockwood			50	38 00	12,676	715

THIS INDENTURE made in duplicate this 30th day of September, in the year of our Lord, A.D. 1912.

BETWEEN

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, hereinafter called the "Commission,"

Party of the First Part,

—and—

THE MUNICIPAL CORPORATION OF THE TOWN OF WELLAND, hereinafter called the "Corporation,"

Party of the Second Part.

WHEREAS pursuant to an Act to provide for the transmission of electrical power to Municipalities the Corporation applied to the Commission for a supply of power and the electors of the Corporation assented to a By-law authorizing the Corporation to enter into a contract with the Commission for such power.

1. NOW THEREFORE this indenture witnesseth that in consideration of the premises and of the agreements of the Corporation set forth, subject

to the provisions of said Act and amendments and of the said contract, the Commission agrees with the Corporation:—

(*a*) To reserve and deliver at the earliest possible date 100 h.p. of electrical power to the Corporation.

(*b*) At the expiration of thirty (30) days' notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electrical power when called for in blocks of 50 h.p. each until 1,000 h.p. is being delivered or is reserved by the Company. And then in blocks of 100 h.p. each for any aditional power.

(*c*) To use at all times first-class, modern, standard, commercial, apparatus and plant, and to exercise due skill and dilligence so as to secure the most perfect operation of the plant and apparatus of the Corporation.

(*d*) Power shall be delivered to the Corporation at approximately 12,000 volts or 2,200 volts—as may be agreed.

2. In consideration of the premises and of the covenants and agreements herein set forth, the Corporation agrees with the Commission:—

(*a*) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement, so as to be able to give notice as specified in Paragraph 1 (*a*).

(*b*) Subject to the provisions of Paragraph 2 (*h*) herein to pay the Commission the cost price per h.p. per annum to the Commission for all power taken.

(*c*) Further to pay annually interest at the rate of four per cent. (4%) per annum on moneys expended, if any, by the Commission on capital account for the construction of necessary works, if any, required to supply said power for the said Corporation.

(*d*) Also to pay an annual part of the cost of construction of the said works so as to form in 30 years a sinking fund for the retirement of any securities issued by the Province of Ontario in connection herewith.

(*e*) To pay any cost of operating, maintaining, repairing, renewing and insuring the said works.

(*f*) The amounts payable in accordance with Clauses 2 (*b*) and (*c*) shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(*g*) To take electric power exclusively from the Commission during the continuance of this agreement.

(*h*) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes same or not. When the greatest amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it for twenty consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for and on the part of the Commission to hold in reserve an additional block of power in accordance with the terms and conditions of this contract.

When the power factor of the greatest amount of power taken for said twenty consecutive minutes falls below 90%, the Corporation shall pay for 90% of said power divided by the power factor.

(*i*) To use at all times first-class, modern, standard commercial apparatus and plant to be approved by the Commission.

(*j*) To exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and the Corporation.

3. This agreement shall remain in force for thirty years from the date hereof.

4. (*a*)—The power so taken shall be measured at the 12,000 volt side of the step-down transformers in the sub-station in the Corporation by Graphic Recording Curve Drawing Meters, subject to test as to accuracy by either party hereto.

(*b*) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of the power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission

shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of said power during such time, but as soon as the cause of such interruption is removed, the Commission shall without any delay supply said power as aforesaid, and the Corporation shall take the same and shall be prompt and diligent in removing and overcoming such cause or causes of interruption.

7. If, and so often as, any interruption shall occur in the service of the Company due to any cause or causes, other than those provided for by the next preceding paragraph hereof, the Commission shall recover and pay to the Corporation as liquidated and ascertained damages and not by way of penalty, as follows:—For any interruption less than one hour double the amount payable for power which should have been supplied during the time of such interruption; and for any interruption of one hour or more, the amount payable for the power which should have been supplied during the time of such interruption and twelve times the last mentioned amount in addition thereto, and all moneys payable under this paragraph when the amount thereof is settled between the Commission and the Company may be deducted from any moneys payable by the Corporation to the Commission, but such right of deduction shall not in any case delay the said monthly payments.

8. If at any time any other Municipal Corporation or pursuant to the said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing, of a time and place and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantity of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor-in-Council.

No such application shall be granted if the said line is not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application without the written consent of such Corporation.

In determining the quality of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such corporation, but such corporation shall not be liable to pay for the power so supplied, or otherwise in respect thereof. In order to prevent discrimination by the Municipal Corporation, no power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission, but the Corporation may sell power to any person or persons or manufacturing companies inside the limits of the Corporation, but such power shall not be sold for less than the cost and without discrimination as regards price and quantity.

9. In case any Municipal Corporation, or any person, firm or corporation which shall contract with the Commission or with any municipal corporation for a supply of power furnished to the Commission by the Power Company shall suffer damages by the act or neglect of the Power Company, and such municipal corporation, person, firm or corporation would, if the Power Company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence any such proceedings to bring such actions for or on behalf of such municipal corporation, person, firm, or corporation, and notwithstanding any Acts, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such Municipal Corporation, person, firm or corporation, including the right to recover such damages, but no action shall be brought by the Commission until such municipal corporation, person, firm or corporation shall have agreed with the Commission to pay any costs that may be adjudged to be paid if such proceedings or action is unsuccessful. The rights and remedies of any such municipal corporation, person, firm or corporation shall not be hereby prejudiced.

10. If difference arise between Corporations to whom the Commission is supplying power, the Commission may upon application fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner when possible, adjust such differences and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the Act respecting Enquiries concerning Public Matters.

11. If difference arise between the Corporation and the Commission, the Lieutenant-Governor-in-Council may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Lieutenant-Governor-in-Council shall in a summary manner, when possible, adjust such differences and such adjustment shall be final. The Lieutenant-Governor-in-Council shall have all the powers that may be conferred Commissioner appointed under the Act respecting Enquiries concerning Public Matters.

12. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

IN WITNESS WHEREOF the Commission and the Corporation have respectively affixed their corporation seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION.

(Signed) A. BECK, Chairman. [Seal]

(Signed) W. W. POPE, Secretary.

MUNICIPAL COUNCIL TOWN OF WELLAND.

(Signed) G. W. SUTHERLAND, [Seal]
Mayor.

(Signed) GEORGE R. BOYD, Clerk.

(Signed) F. A. MILLEN, Witness.

THIS INDENTURE made in duplicate this 20th day of July, in the year of our Lord, 1911.

BETWEEN:

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, hereinafter called the "Commission,"

Party of the First Part,

—and—

THE MUNICIPAL CORPORATION OF THE TOWN OF MIDLAND, hereinafter called the "Corporation,"

Party of the Second Part.

WHEREAS, pursuant to "An Act to provide for transmission of electrical power to Municipalities," the Corporation applied to the Commission for a supply of power, and the Commission have entered into a contract with the Simcoe Railway & Power Co., and the electors of the Corporation assented to a by-law authorizing the Corporation to enter into a contract with the Commission for such power.

1. NOW THEREFORE THIS INDENTURE WITNESSETH that in consideration of the premises and of the agreements of the Corporation herein set forth, subject to the provisions of said Act and of the said contract, the Commission agrees with the Corporation:—

(*a*) At the expiration of thirty days' notice in writing from the Corporation to the Commission, to reserve and deliver when called for 400 h.p. or more of electric power to the Corporation. Said notice shall be given not later than June 15th, 1911.

(*b*) At the expiration of thirty days' notice in writing which may be given by the Corporation from time to time, during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for in blocks of 50 h.p. each until 500 h.p. is being delivered or is reserved by the Power Company, and then in blocks of 100 h.p. each until the total amount so reserved or delivered shall amount to 1,600 h.p.

(*c*) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so as to secure the satisfactory operation of the plant and apparatus of the Corporation.

(*d*) The power shall be delivered to the Corporation at approximately 2,200 volts and at approximately 60 cycles per second.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(*a*) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to give notice as specified in paragraph 1 (*a*).

(*b*) Subject to the provisions of paragraph 2 (*e*) hereof, to pay the Commission the following prices: $21.00 per h.p. per annum for all power

reserved or taken until the demands of the Commission on the Power Company shall equal or exceed 500 h.p.

When the demand of the Commission on the Power Company shall have increased to 500 h.p. to pay $20.00 per h.p. per annum for all or any proportion thereof reserved or taken by the Corporation.

When the demand of the Commission on the Power Company shall have increased to 1,000 h.p. to pay $19.00 per h.p. per annum for all or any proportion thereof reserved or taken by the Corporation.

When the demand of the Commission on the Power Company shall have increased to 1,500 h.p. to pay $17.50 per h.p. per annum for all or any proportion thereof reserved or taken by the Corporation.

Nothing herein contained shall bind the Commission to supply power on the demand of the Corporation after the demand of the Commission on the Power Company exceeds 1,600 h.p. unless the Power Company has power available or capable of development.

(*c*) The power shall be paid for in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(*d*) To take electric power exclusively from the Commission during the continuance of this agreement.

(*e*) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the greatest amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it for twenty consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for and on the part of the Commission to hold in reserve an additional block of power in accordance with the terms and conditions of this contract.

When the power factor of the greatest amount of power taken for said twenty consecutive minutes falls below 90%, the Corporation shall pay for 90% of said power divided by the Power Factor.

(*f*) To use at all times first-class, modern, standard, commercial apparatus and plant to be approved by the Commission.

(*g*) To exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and the Corporation.

3. This agreement shall remain in force for ten years from the date of the expiration of the said first notice of 30 days. The Corporation may, at its option, continue this agreement for one or two further consecutive terms, the first of these two additional terms being of five years duration, and the second of such length that the expiry thereof shall fall on the 10th day of September, 1929.

(*a*) Provided, however, that in the event of the Commission being in a position to furnish power either by a further agreement with the Simcoe Railway & Power Company or otherwise, the Corporation may, at its option. continue this agreement for a further term of twelve years duration.

(*b*) The Corporation may exercise the first of these options by giving notice in writing of its intention to continue this agreement for the second term of five years at least two years before the expiration of the first term of ten years.

(*c*) The Corporation may exercise the second of these options by giving notice in writing of its intention to continue this agreement for the third term until the expiry date on September 10th, 1929, at least two years before the expiration of the second term of five years.

(*d*) The Corporation may, subject to the conditions set out in paragraph 3 (*a*), exercise the further option therein mentioned by giving the Commission notice in writing of its intention to continue this agreement for the further term of twelve years at least two years before the expiration of the term falling on the 10th day of September, 1929.

4. The power shall be approximately 2,200 volts, 60 cycle, 3 phase, alternating commercially continuous twenty-four hour power every day in the year except as provided herewith, and shall be delivered by the Commission to the Corporation at the Low Tension outlet bushings of the Sub-station of the Simcoe Railway & Power Co., at the outskirts of the Town of Midland.

(*a*) The power so taken shall be measured at the 2,200 volt switchboard in said Sub-station by Graphic Recording Curve Drawing Meters, subject to test as to accuracy by either party hereto.

(*b*) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the Sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of the power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of said power during such time, but as soon as the cause of such interruption is removed, the Commission shall without any delay supply said power as aforesaid, and the Corporation shall take the same and shall be prompt and diligent in removing and overcoming such cause or causes of interruption.

7. If, and so often as, any interruption shall occur in the service of the Power Company due to any cause or causes, other than those provided for by the next preceding paragraph hereof, the Commission shall recover and pay to the Corporation as liquidated and ascertained damages, and not by way of penalty, as follows:—For any interruption of less than one hour double the amount payable for power which should have been supplied during the time of such interruption; and for any interruption of one hour or more the amount payable for the power which should have been delivered during the time of such interruption, and six times the last mentioned amount in addition thereto, and all moneys payable under this paragraph, when the amount thereof is settled between the Commission and the Company, may be deducted from any money payable by the Corporation to the Commission, but such right of deduction shall not in any case delay the said monthly payments.

8. If at any time any other Municipal Corporation or, pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing, of a time and place and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid, for equal quantity of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor-in-Council.

No such application shall be granted if the said line is not adequate for such supply, or if the supply of the Corporation will not be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such corporation, but such corporation shall not be liable to pay for the power so supplied, or otherwise in respect thereof. In order to prevent discrimination by the Municipal Corporation, no power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission, but the Corporation may sell power to any person or persons or manufacturing companies inside the limits of the Town of Midland, but such power shall not be sold for less than the cost and without discrimination as regards price and quantity.

9. In case any municipal corporation, or any person, firm or corporation which shall contract with the Commission or with any municipal corporation for a supply of power furnished to the Commission by the Power Company shall suffer damages by the act or neglect of the Power Company, and such municipal corporation, person, firm or corporation would, if the Power Company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence any such proceedings or bring such action for or on behalf of such municipal corporation, person, firm or corporation, and notwithstanding any Acts, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such municipal corporation, person, firm or corporation, including the right to recover such damages, but no action shall be brought by the Commission until such Municipal Corporation, person, firm or Corporation shall have agreed with the Commission to pay any costs that may be adjudged to be paid if such proceedings or action is unsuccessful. The rights and remedies of any such municipal corporation, person, firm or corporation shall not be hereby prejudiced.

10. If differences arise between corporations to whom the Commission is supplying power, the Commission may upon application fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences and such adjustment shall be final. The Commission shall have all the power that may be conferred upon a Commissioner appointed under the Act respecting Enquiries concerning Public Matters.

11. If differences arise between the corporation and the Commission, the Lieutenant-Governor-in-Council may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Lieutenant-Governor-in-Council shall, in a summary manner, when possible, adjust such differences and such adjustment shall be final. The Lieutenant-Governor-in-Council shall have all the powers that may be conferred upon a Commissioner appointed under the Act respecting Enquiries concerning Public Matters.

12. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

IN WITNESS WHEREOF the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION.
(Signed) A. BECK, Chairman. [Seal]
(Signed) W. K. McNAUGHT, Commissioner.

MUNICIPAL CORPORATION TOWN OF MIDLAND.
(Signed) DIGBY HARRELL, Mayor. [Seal]

(Signed) FRANK R. WESTON, Clerk.

Agreements between the Hydro-Electric Power Commission and the Municipal Corporation of the Village of Port Dalhousie; the Municipal Corporation of the Town of Penetanguishene; the Municipal Corporation of the Town of Barrie; the Municipal Corporation of the Town of Coldwater; the Municipal Corporation of the Town of Staynor, the Municipal Corporation of the Police Village of Elmvale; the Municipal Corporation of the Town of Collingwood, and the Municipal Corporation of the City of Peterborough, which should appear in the foregoing Act, have been omitted.

AGREEMENTS

During the fiscal year, agreements for a supply of power have been made with the Municipalities of Beaverton, Thorndale, Cannington, Brechin, Sunderland, Woodville, Winchester, Brockville, Prescott, Chesterville, Hagersville, Elmvale, Welland, Port Dalhousie, Port Robinson, Windsor, Peterborough, and the Township of Toronto.

RIGHT OF WAY

High Tension Lines

Contracts having been entered into with the Municipalities of Windsor and Walkerville, it was found necessary to purchase additional right-of-way from St. Thomas to Chatham, a distance of 58 miles, and from Chatham to Windsor, a distance of 47 miles, making a distance of 105 miles in all. After careful consideration and investigation of the whole matter the Commission decided it would be in the public interest to purchase the land upon which the High Tension towers were to be erected outright in fee simple instead of following the previous plan of buying thirty year easements. It was, therefore, decided that a strip of land 66 ft. wide would be purchased for this section of the line.

With this end in view the Right-of-way staff was again organized, consisting of Chief Right-of-way Agent and two assistants, which was subsequently increased to four assistants. On this section of the line there are some 475 owners to be dealt with and the agreements included the taking of the land outright, damages to trees, crops, fences, and moving of buildings, etc.

In order that the Commission would have direct supervision over every branch of the work it was decided by the Board that the work would be carried on by themselves instead of being let out under contract, and the results so far have fully justified the Commission in this decision.

Work has been vigorously pushed and a large number of owners have been settled with. There are still a number of agreements outstanding, but it is expected that these will be closed up within a short time.

It was decided to open an office at Chatham in connection with the Engineering Department in order that the work might be facilitated.

Low Tension Lines

During the past year approximately two hundred miles of low tension pole lines have been constructed, about forty-five miles in the eastern part of the Province from Morrisburg to Prescott, Winchester, Chesterville, and one hundred and fifty miles of line in the central part of the Province. Two of the assistant Right-of-way agents have been on this work continuously, securing easements and leases from the various owners, settling for tree trimming and other damages.

CROSSINGS

It has been found necessary during the past year to secure permission from the various steam and electric railway, telephone and telegraph companies for the crossing of their lines by the wires of the Commission. In each case blue-prints

and formal application has been made to the Company and where the consent of the Company was given the matter ended. In cases where the Company refused the sanction the crossing additional blue-prints were made and formal application sent to the Board of Railway Commissioners at Ottawa, for their ruling in these matters. It is expected in view of the fact that the Transmission line from St. Thomas to Windsor is now well under way that the number of these crossings will be greatly increased during the coming year.

UNDERGROUND CONSTRUCTION

In accordance with the joint application of the City of Hamilton, dated April 25th, 1912, to the Board of Railway Commissioners for Canada and the Hydro-Electric Power Commission of Ontario, set out in the Fifth Report, the Commission took this matter up. The representatives of the City of Hamilton and the interested Companies waited upon the Board a number of times, and after a thorough and careful investigation by the Engineering Department, the following order was made by the Board:—

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

Dated the 14th day of November, A.D. 1912.

In the matter of overhead lines or wires of the Hamilton Electric Light and Cataract Power Company, Limited, The Hamilton Cataract Power, Light and Traction Company, Limited, the Cataract Power Company of Hamilton, Limited, and of the Hydro-Electric Department of the City of Hamilton, on certain streets in the City of Hamilton.

And in the matter of the Power Commission Act of 1912.

UPON the report of their Engineer the Commission being of the opinion that it is necessary and expedient for the protection of life and property and for the convenience of the public that the use of overhead lines or wires of the Hamilton Electric Light and Cataract Power Company, Limited, the Hamilton Cataract Power, Light and Traction Company, Limited, the Cataract Power Company of Hamilton, Limited, and of the Hydro-Electric Department of the City of Hamilton, upon those portions of the highways or public communications hereinafter named in the City of Hamilton, should be discontinued and disallowed, and that such lines or wires should be placed and carried in underground conduits, to be constructed and maintained in accordance with the directions and to the satisfaction of the Commission, and that any and all right or rights to carry lines or wires on poles on the said portions of the said highways or public communications in the said City of Hamilton which may have been given by any Act, or by any municipal by-law, license or agreement, shall be abrogated, as herein provided.

IT IS ORDERED that the use of overhead lines or wires, other than trolley wires, of the Hamilton Electric Light and Cataract Power Company, Limited, the Hamilton Cataract Power, Light and Traction Company, Limited, the Cataract Power Company of Hamilton, Limited, and of the Hydro-Electric Department of

the City of Hamilton, on the following portions of highways or public communications in the City of Hamilton, namely:—

Catharine Street from Jackson Street to Rebecca Street,
John Street from Hunter Street to Rebecca Street,
Hughson Street from Hunter Street to Jackson Street,
Hughson Street from King Street to Gore Street,
James Street from Hunter Street to Stuart Street,
McNab Street from Main Street to Vine Street,
Charles Street from Main Street to King Street,
Park Street from Main Street to Merrick Street,
Bay Street from Main Street to York Street,
Jackson Street from James Street to Catharine Street,
Main Street from Bay Street to Catharine Street,
King Street from Sophia Street to Stirton Avenue,
York Street from Bay Street to James Street,
King William Street from James Street to Hughson Street,
Rebecca Street from James Street to Catharine Street,
Merrick Street from James Street to Park Street, as
shown on the map or plan hereto attached,

shall be discontinued as hereinafter provided, and that any and all right or rights to carry lines or wires, other than trolley wires, on poles on the said portions of the said highways or public communications in the said City of Hamilton, which may have been given by any Act, municipal by-law, license or agreement shall be abrogated.

IT IS FURTHER ORDERED that the said lines or wires shall be placed and carried in an underground conduit system or systems which shall be constructed in accordance with plans and specifications approved in writing by the Commission, and that such underground conduit system or systems shall be maintained to the satisfaction of the Commission, in accordance with such directions as may be given by the Commission from time to time.

IT IS FURTHER ORDERED AND DIRECTED that plans and specifications for such underground conduit system or systems shall forthwith be prepared by the Hydro-Electric Department of the City of Hamilton and submitted by the said Department to the Commission not later than January 2, 1913, and that all information for the design and construction of the underground conduit system or systems required by the said Department for the preparation of the said plans and specifications shall be delivered to the said Department by the said Companies on or before the 16th day of December, 1912.

IT IS FURTHER ORDERED AND DIRECTED that the Hydro-Electric Department of the City of Hamilton shall with all due dispatch proceed to construct and complete or cause to be constructed and completed the said underground conduit system or systems in accordance with the plans and specifications above referred to, with such amendments as may be made from time to time.

IT IS FURTHER ORDERED AND DIRECTED that upon notice by the Commission from time to time of the completion of any portion of the said underground conduit system or systems for any portion of the said highways or public communications, the Companies shall within the time mentioned in such notice

discontinue the use of overhead lines and wires, other than trolley wires, upon the portion of the said highways or public communications covered by the said notice, and any right to carry lines or wires, other than trolley wires, on poles on the portions of the said highways or public communications covered by such notice shall be abrogated as of the date mentioned in such notice.

IT IS FURTHER ORDERED AND DIRECTED that the cost of the construction and maintenance of the said underground conduit system or systems shall be paid proportionately by the said Hydro-Electric Department of the City of Hamilton and the said Companies in accordance with such portion of the said underground conduits as may be set aside for the said Department or for any of the said Companies in the said plans and specifications, or any amendment thereof: and payments of such proportions shall be made by the respective Companies from time to time to the Hydro-Electric Department of the City of Hamilton within fifteen (15) days after such payment is demanded by the said Department, such demands being based upon progress certificates of the Engineer in charge of the work in question.

IT IS FURTHER ORDERED AND DIRECTED that the Hydro-Electric Department of the City of Hamilton (or the City of Hamilton), shall pay to the said Companies such sum or sums, if any, by way of compensation for the removal of such works as are discontinued on the said street or streets at such times and in such manner as the Commission may hereafter by order determine.

IT IS FURTHER ORDERED AND DIRECTED that the provisions of this order shall be carried out in accordance with such further orders, directions or regulations as the Commission may deem necessary to make from time to time.

HYDRO-ELECTRIC POWER COMMISSION,

(Signed) A. Beck, *Chairman.*
(Signed) W. K. McNaught, *Commissioner.*

Examined and Certified
a True Copy,
(Signed) W. Pope, *Secretary.*

OVERHEAD CONSTRUCTION

On July 17th, 1913, the City of Toronto applied to the Commission for the approval of works in connection with the Civic Car Lines built on St. Clair Avenue for the conducting, furnishing, and distributing of electricity as shown on the plans set with the application. The representatives of the City, the Toronto Electric Light Company, the Interurban Electric Company and the Toronto Hydro-Electric System met at the office of the Commission in this matter a number of times and the matter was gone into thoroughly.

The Engineering Department made a careful investigation and reported such changes and alterations of the wires of the various companies as would be in the public interest. These changes were agreed upon by the Companies, and upon the report of the Engineering Department the Board made the following order in the matter:

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

In the matter of the application of the Corporation of the City of Toronto for the approval of works for the conducting, furnishing and distributing of electricity in, under and upon certain highways in the City of Toronto, as shewn on plans of the City of Toronto for the Civic Car lines on St. Clair Avenue from Yonge Street to the Grand Trunk Railway crossing (Northern Division) Sheet 1—from Yonge Street to Walmer Road; Sheet 2—from Kendal Avenue to Alberta Avenue; Sheet 3—from Oakwood Avenue to the Grand Trunk Railway crossing (Northern Division), as filed with the application.

UPON THE REPORT of the Engineer of the Board and proof of service of application upon the Toronto Electric Light Company, the Interurban Electric Company and the Toronto Hydro-Electric System, and the parties having appeared and been heard:

IT IS ORDERED THAT the construction of the overhead wires and cables and the structures for the carrying of same for the operation of the St. Clair Avenue civic car lines, as shown on the plans, Numbers 1, 2, and 3, on file, and set out in the application, is approved, upon the completion of the changes, as set out in the report of the Engineer, hereto attached.

IT IS FURTHER ORDERED AND DIRECTED that the wires, cables and structures of the Toronto Electric Light Company, the Interurban Electric Company and the Toronto Hydro-Electric system, be re-constructed to give a minimum clearance of five feet between the wires, cables and structures of the above companies and the wires, cables and structures of the City of Toronto Civic Car lines on St. Clair Avenue, as set out in the Engineer's report hereto attached and the revised plans submitted with the application.

IT IS FURTHER ORDERED AND DIRECTED that the above changes in the lines and systems of the companies required to be done shall be carried out by the companies at the expense of the Applicant, and the cost of such work shall be submitted to the Commission for approval.

THE APPLICANT SHALL SUBMIT PLANS to the respective parties where interference of the system occurs, showing the present location and the reconstructed work to comply with the above ruling. Three copies of such revised plans shall be submitted to the Commission.

IN THE CARRYING OUT OF the above orders, the Commission shall be notified in sufficient time, so that a representative may be on the ground for the purpose of inspection and to obtain all data on costs of the work.

DATED this 14th day of August, A.D. 1913.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman.*

W. K. MCNAUGHT.

CHAPTER II

TRANSMISSION SYSTEMS

STEEL TOWER TRANSMISSION LINES

Preliminary Surveys

The surveys for the route of the Windsor Transmission Line were commenced in January, 1913, although a considerable amount of preliminary investigation was done during the years 1911 and 1912.

Early in January, 1913, an exhaustive study was begun of routes between St. Thomas and Windsor, taking into consideration relative costs, right of way, length of line, difficulties of construction of tower and wood pole lines, necessity for bridging and the general character of the country passed through. Several different routes were investigated and the following finally adopted.

Route

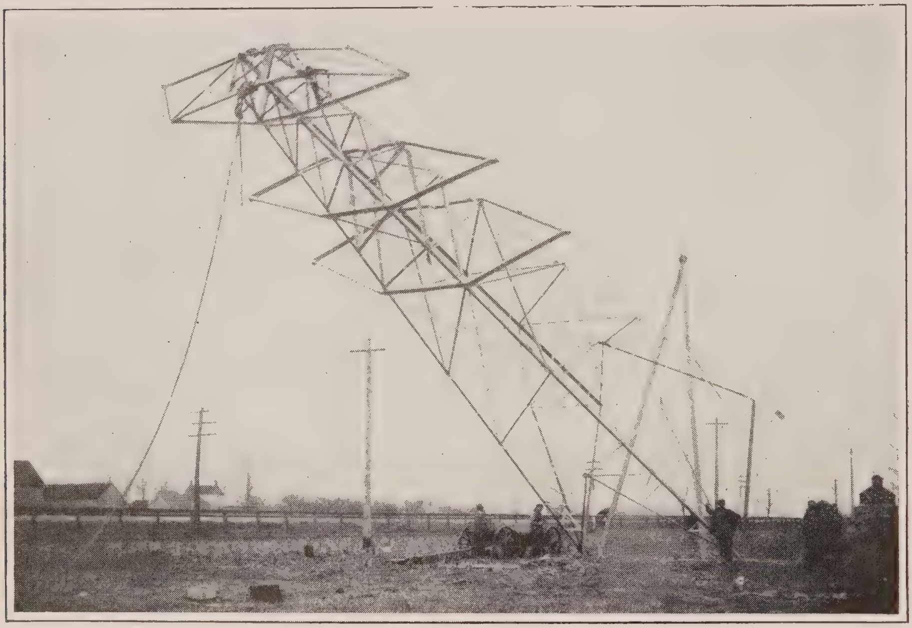
Commencing at the St. Thomas Substation, this line runs in a westerly direction a distance of 1.4 miles to the intersection of the Edgeware Road and crosses the Southwestern Traction and the Wabash Division of the Grand Trunk. It then deflects to the left and paralleling the Edgeware Road, it runs for a distance of 7 miles to a point immediately south of the Michigan Central Railway near the Village of Shedden. In this section it crosses Dodd's Creek and the main line of the Michigan Central Railway. At Shedden the line deflects to the left crossing the Pere Marquette Railway there and parallels this railway for a distance of 37.1 miles to a point just west of Ridgetown. In this section it passes through the villages of Shedden, Iona, Dutton, West Lorne, Rodney, Muirkirk and Highgate. and after crossing the Pere Marquette Railway just east of Ridgetown, passes through the northern part of this town. At this point it deflects to the right and runs straight across country, a distance of 10.7 miles to a point in Lot 7, Concession 3, R.T. Township of Harwich. In this section the main line of the Michigan Central Rly. is crossed. The line then deflects to the left and paralleling the road allowances, runs in a southwesterly direction through the City of Chatham, a distance of 3.5 miles, to a point in Lot 20, Concession 2, R.T. Township of Raleigh. At this point it deflects to the right and parallels the G. T. Rly. immediately to the south of it for a distance of 3.3 miles to the intersection of this railway with the Canadian Pacific Rly. It then deflects to the left and parallels the Canadian Pacific Rly. immediately on the south side of it for a distance of 39.8 miles to Walkerville Junction, where a suitable substation site can be had. The total length of this line is 102.8 miles, being much the shortest line of all those investigated. For many reasons it is the most economical to be built on account of the great length of line which parallels and is adjacent to railway lines, right of way would be much cheaper than any other line investigated. Also construction could be done at a lesser cost on account of the railway facilities for distribution of material. From Chatham to Walkerville Jct. the amount of bridging necessary would be slightly more than that of any other line on account of the fact that it is much closer to Lake St. Clair where the rivers and drains are much larger. This, however, is not a serious matter and would count very little against the choice of a location.

Contracts for Material

During the latter part of 1912 various types of transmission line construction work were considered, and it was decided to use tandem construction, where the three wires of each circuit would be in one plane approximately vertical, and removed about 7 feet from the face of the conductor support.

On account of market and other conditions, No. 3/0 B. & S. gauge copper cable was specified for conductors, and a standard span of 660 feet between conductor supports was adopted.

The standard specifications of the Commission were issued January 29th, 1913, and tenders asked for the supply of the different kinds of transmission line material required.



Tower Erection—Windsor Extension

Contracts for this material were let to the following companies:—

To the Canadian Bridge Co., of Walkerville, the supply of steel towers and footings.

To the Galt Malleable Iron Co., the supply of malleable iron clamps.

To the Canadian Porcelain Co., of Hamilton, the supply of insulators.

To the Canada Wire and Cable Co., the Imperial Wire and Cable Co., and the Steel Company of Canada, the supply of No. 3/0 B. & S. gauge copper cable.

Telephone line material was taken from the Commission's stores.

Organization

Early in 1913 instructions were issued by the Commission to undertake the work of construction of the Windsor Transmission and Telephone lines, along lines similar to the construction of the Low Tension lines, and an organization was formed to take care of this work.

The gangs employed for transmission line work were as follows:—

Two gangs, each of about 25 men, excavating for tower footings.

Two gangs, each of about 20 men, setting tower footings.

One gang of about 10 men building culverts and bridges, and temporary fencing.

One gang of about 12 men clearing right-of-way.

Two gangs, each about 25 men, assembling towers.

Two gangs, each 7 men, erecting towers.

The unloading of tower steel was done by a gang of six men, and the steel was delivered to the tower locations by teams hired along the line.

Each one of the above gangs was in charge of a foreman, who received his instructions from the general foreman in his section.

The gangs employed for Telephone line work were as follows:—

One gang of 15 men digging holes.

One gang of 10 men erecting poles.

One gang of 3 men unloading and framing poles.

One gang of four men assembling and erecting cross arms, setting anchors and attaching guys.

One gang of 8 men stringing wire.

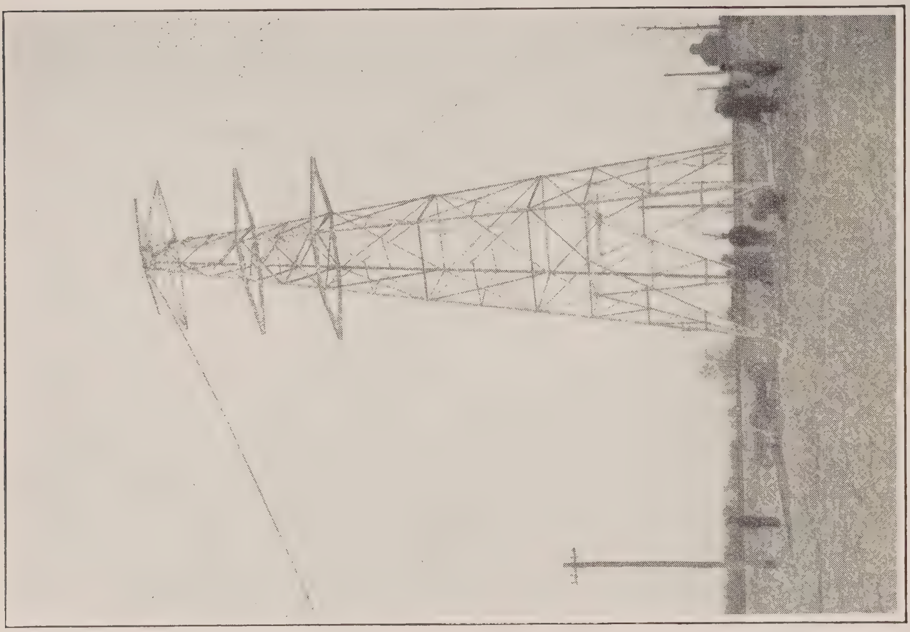
Each of these gangs was in charge of a foreman, who received his instructions from the General Foreman of the telephone line.

Progress of Construction

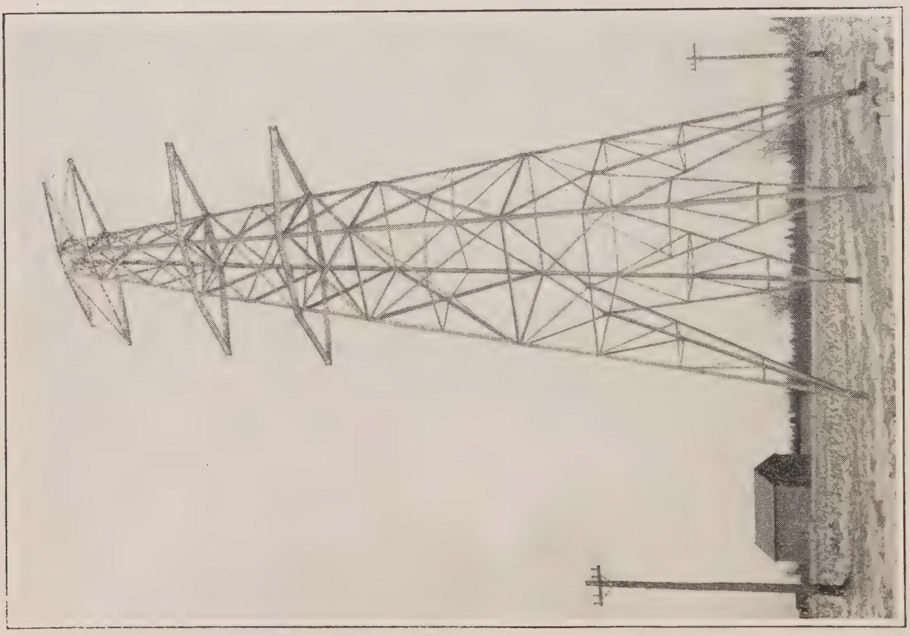
The work of excavating and setting tower footings was begun July 1st, 1913, and was carried forward at such a rate that on Oct. 31st only 76 of the 860 footings remained to be set. The footing gangs met with a good deal of trouble from water in the case of tower footings from Chatham to Tilbury. These were the first set, and the ground was still full of water. Also in the neighborhood of Ridgetown, West Lorne, and Dutton, a good deal of quicksand was found, and shoring of the holes was necessary. In all cases, however, a good solid bottom was reached at the standard depth.

Culverts and bridges were commenced a week ahead of the tower footings and were kept well in advance of this work throughout.

Tower assembling was begun on Oct. 7th and the first tower was erected on Oct. 14th. Up to the end of the month 52 towers had been assembled and erected. During this time considerable trouble was experienced with the bolts supplied to the Commission, and work was hampered thereby. However, bolt trouble was being remedied by the end of the month and the gangs were making better progress.



Tower Erection—Windsor Extension



Standard Line Tower—Windsor Extension

Work on the telephone line was begun early in August, and the first pole erected on August 16th. The digging of holes and erecting of poles was carried forward rapidly, so that this part of the work was practically complete from Chatham to Windsor by Oct. 31st.

On October 6th wire stringing was begun on the telephone line, and a temporary line was strung to the Construction Office of the Commission in Chatham. This was done so that the assembling, erecting, and telephone gangs might be in touch with the Superintendent at all times by telephone.

Thirteen miles of double circuit line had been strung by the end of October.

Work Completed

The construction work completed up to October 31st. 1914, was as follows:—

Transmission Line

Section L. St. Thomas to Chatham.

Footings distributed	430
Holes dug for footings	443
Footings set	410

Section M. Chatham to Walkerville Jct.

Footings completed	373
Towers unloaded	290
" distributed	130
" assembled	52
" erected	52

Telephone Line

Section "L."

Holes dug for poles	85
Poles framed and gained	93

Section "M."

Holes dug	1,825
Poles hauled	1,788
Poles framed and gained	1,788
Poles erected	1,782
Anchors dug	55
Anchors set	55
Brace poles dug	3
Brace poles erected	3
Guys attached	18
Cross arms distributed	902
Cross arms erected	543
Telephone wire strung	13 miles of double circuit.

The surveys for both sections were also completed.

Work Uncompleted

The construction work remaining to be done at the beginning of the fiscal year of 1914 was as follows:—

Transmission Line

Sec. L. St. Thomas to Chatham.

Footings to be distributed	56	
Holes to be dug for footings	43	
Footings to be set	76	
Towers to be unloaded and delivered	486	
Towers to be assembled and erected	486	
Insulators to be delivered and erected	3,375	
Power cable to be delivered and erected	350	wire miles
Ground cable to be delivered and erected	116	" "

Sec. M. Chatham to Walkerville Junction.

Towers to be unloaded	84	
Towers to be delivered	244	
Towers to be assembled and erected	322	
Insulators to be delivered and erected	2,600	
Power cable to be delivered and erected	270	wire miles
Ground cable to be delivered and erected	90	" "

Telephone Line

Sec. L.

Holes to be dug for poles	2,293	
Poles to be framed	2,285	
Poles to be hauled and erected	2,378	
Cross arms to be erected	2,400	
Telephone wire to be strung	232	wire miles

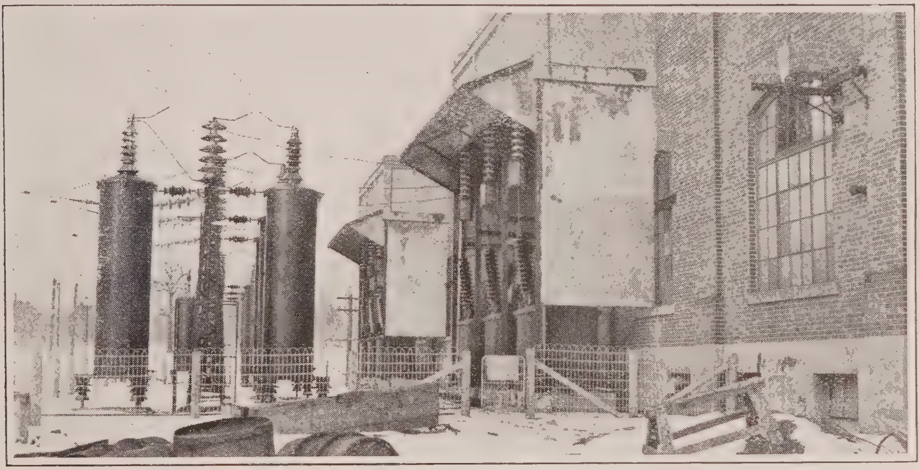
Sec. M.

Holes to be dug for poles	4	
Poles to be framed and hauled	41	
Poles to be erected	47	
Cross arms to be erected	1,300	
Wire to be strung	128	wire miles

TRANSFORMER STATIONS

The major portion of the work performed consisted of the designing and partial construction of Brant, Kent and Essex 110,000 volt transformer stations, as well as of extensions to Niagara Falls, Dundas, Toronto, London, Berlin, Stratford, St. Thomas and Cooksville, 110,000 volt transformer stations.

In addition to the above, distributing stations (4,000 or 2,300 volt secondaries) were or are at present being constructed at Hagersville, Georgetown, Rockwood, Breslau, Elmira, Streetsville and Dorchester in the Niagara System, at Elmvale and Stayner in the Severn District and at Prescott in the St. Lawrence District. Specifications are in course of preparation for distributing stations at Chesterville and Winchester in the St. Lawrence District.



Niagara Falls Transformer Station, 110,000 Volt Arresters and Outdoor Switches

Sub-station equipment has been purchased for the municipalities of Welland, Dundas, Galt, Preston, Berlin, St. Thomas, Paris, Brantford, Milton, Goderich and Clinton.

At Port Arthur an extension was made to the existing station.

In connection with the Wasdell's Falls development, the electrical equipment for the power station was purchased.

The Toronto Storehouse and Laboratory was completed and placed in service and a small storehouse was constructed in the Dundas Transformer station property.

The following is a table giving the capacity of the transformers in different Hydro-Electric Stations at present installed and for which contracts have been awarded. (See Table No. 1.) Table No. 2 gives a list of station transformers purchased during the past year for the municipalities as well as stations of the Commission.

Table No. 1

Transformer Station Capacities

Niagara System	25 Cycle Voltage	Installed Kv-A.	Contracted for Kv-A.	Total Kv-A.	
1. Niagara Transformer Station	12,000-110,000	42,000	10,500	......	
	12,000- 46,000	....	21,000	73,500	
2. Dundas Transformer Station	110,000- 13,200	7,500	....	7,500	
Caledonia Dist. Station	13,200- 2,300	450	....	450	
Waterdown "	13,200- 2,300	225	....	225	
Hagersville "	13,200- 2,300	225	....	225	
3. Toronto Transformer Station	110,000- 13,200	17,500	7,500	25,000	
4. London Transformer Station	110,000- 13,200	5,000	....	5,000	
Dorchester Dist. Station	13,200- 4,000	....	75	75	
5. Guelph Transformer Station	110,000- 13,200	3,000	....	3,000	
Acton Dist. Station	13,200- 2,300	225	....	225	
Georgetown "	13,200- 4,000	225	....	225	
Rockwood "	13,200- 2,300	75	....	75	
6. Preston Transformer Station	110,000- 6,600	3,000	1,500	4,500	
Breslau Dist. Station	6,600- 2,300	225	....	225	
7. Berlin Transformer Station	110,000- 13,200	3,000	1,500	4,500	
New Hamburg Dist. Station	13,200- 2,200	225	....	225	
Baden " "	13,200- 2,300	225	....	225	
Elmira " "	13,200- 4,000	225	....	225	
8. Stratford Transformer Station	110,000- 13,200	3,000	....	......	
	110,000- 26,400	....	5,000	8,000	
9. St. Mary's Transformer Station	110,000- 13,200	3,000	....	3,000	
St. Mary's Cement D. S.	13,200- 575	1,500	....	1,500	
10. Woodstock Transformer Station	110,000- 13,200	3,000	....	3,000	
Norwich Dist. Station	13,200- 2,300	150	....	150	
Beachville "	13,200- 2,300	150	....	150	
11. St. Thomas Transformer Station	110,000- 13,200	3,000	....	3,000	
Port Stanley Dist. Station	13,200- 2,300	150	....	150	
12. Cooksville Transformer Station	110,000- 13,200	5,000	....	5,000	
Mimico Dist. Station	13,200- 2,300	225	....	225	
Port Credit "	13,200- 2,300	225	....	225	
Cooksville "	13,200- 2,300	50	....	50	
Streetsville "	13,200- 4,000	....	225	225	
13. Brant Transformer Station	110,000- 26,400	....	5,000	5,000	
14. Kent Transformer Station	110,000- 26,400	....	5,000	5,000	
15. Essex Transformer Station	110,000- 26,400	....	10,000	10,000	
					170,075
Severn System	60 Cycle Voltage				
Penetang Dist. Station	22,000- 2,200	400	200	600	
Barrie "	22,000- 2,300	700	....	700	
Collingwood "	22,000- 2,300	750	....	750	
Coldwater "	22,000- 2,300	225	....	225	
Elmvale "	22,000- 2,300	225	....	225	
Stayner "	22,000- 4,000	300	....	300	
					2,800
St. Lawrence System					
Prescott Dist. Station	26,400- 2,300	450	....	450	
					450
Port Arthur System					
Port Arthur Dist. Station	22,000- 2,200	5,250	....	5,250	
					5,250
Wasdell's Falls System					
Power House	2,300 / 22,000	....	1,050	1,050	
					1,050
Grand Total	....	....	....		179,625

The capacity of spare transformers is included in the above.

Table No. 2

Station Transformers Purchased

For Municipalities and Commission during fiscal year ending October 31st, 1913

Station	Frequency	Voltage	No.	Capacity	Total Kv-A.
Niagara Falls Transforming Stat.	25	12,000/110,000	3	3,500	10,500
	25	12,000/ 46,000	6	3,500	21,000
Dundas Transforming Station....					
Corporation of Dundas	25	13,200/2,300/575	3	150	450
Hagersville Distributing station..	25	13,200/2,300/575	3	75	225
Toronto Transforming Station....	25	110,000/13,200	3	2,500	7,500
Guelph Transforming Station					
Central Prison Farm	25	13,200/2,300/575	3	100	300
Georgetown Distributing Station	25	13,200/2,300/575	3	75	225
Rockwood Distributing Station..	25	13,200/2,300/575	3	25	75
Preston Transforming Station					
Corporation of Preston	25	13,200/2,200	3	170	510
Corporation of Galt	25	13,200/2,200	3	150	450
Breslau Distributing Station....	25	13,200/2,200	3	75	225
Berlin Transforming Station......					
Corporation of Berlin	25	13,200/2,200	3	250	750
Elmira Distributing Station....	25	13,200/2,200	3	75	225
Baden Distributing Station.....	25	13,200/2,200	3	75	225
Stratford Transforming Station ..	25	110,000/26,400	4	1,250	5,000
Corporation of Clinton..........	25	26,400/2,300/575	3	150	450
Corporation of Goderich........	25	26,400/2,300/575	3	250	750
London Transforming Station.....					
Dorchester Distributing Station.	25	13,200/2,300/575	3	25	75
St. Thomas Transforming Station					
Corporation of St. Thomas......	25	13,200/2,300/575	3	100	300
" "	25	13,200/2,300/575	3	150	450
Cooksville Transforming Station..					
Corporation of Milton..........	25	13,200/2,300/575	3	250	750
Streetsville Distributing Station	25	13,200/2,300/575	3	75	225
Brant Transforming Station......	25	110,000/26,400	4	1,250	5,000
Corporation of Brantford	25	26,400/2,300/575 (3-phase)	2	750	1,500
Corporation of Paris	25	26,400/2,300/575	3	200	600
Kent Transforming Station	25	110,000/26,400	4	1,250	5,000
Essex Transforming Station......	25	110,000/26,400	4	2,500	10,000
Penetanguishene Distributing Stat.	60	22,000/2,200	1	200	200
Elmvale Distributing Station.....	60	22,000/2,300	3	75	225
Stayner Distributing Station	60	22,000/2,300	3	100	300
Wasdell's Falls Power House	60	2,300/22,000	7	150	1,050
Prescott Distributing Station.....	60	26,400/2,300/575	3	100	300
Total....................	....	....	....	....	74,835

Following is given a general description of the work carried out, divided into the different systems.

Niagara System

Niagara Falls Transformer Station

Fourth Bank of Transformers

In the last report the purchase of the fourth bank of transformers was referred to. This bank was installed and placed in service last spring. In the construction of the station in the year 1909, space was provided for four banks of transformers but at that time only three banks were contracted for. The building is now completely equipped and additional capacity will involve the construction of an extension to the station building.

Switching Equipment

The switching equipment referred to in last report, in connection with the fourth bank of transformers is of more rugged construction than that originally furnished and is more suitable for the service required of it.. The improvements made by the manufacturers are the results of experience obtained by closely following the conditions met on our lines and on similar systems throughout the world. The placing in operation of the 110,000 volt oil switches with resistances previously referred to has improved the service materially. These resistance circuit breakers which are placed outside the building, work in conjunction with breakers inside the building. The two switches are placed in series and when an overload occurs of sufficient magnitude to necessitate opening the circuit, the switch outside the station opens automatically, and in so doing places a resistance between the line and the inside breaker, thereby reducing the load on the oil switch inside the building, which automatically opens the instant following the opening of the breaker outside.

12,000 Volt Feeders

During the summer of the year 1912, a contract was awarded for the supply and installation of a pair of feeder cables for supplying the fourth banks of transformers These cables were installed, tested and placed in service last spring. At the present time there are four feeders in the existing duct line between the station of the Ontario Power Company and that of the Commission; each pair with a capacity equal to that of a transformer bank. When the station was built provision was made for the addition of a spare feeder when required. The contract for the additional cables for this spare feeder was awarded to the Canadian British Insulated Company, their tender being the most advantageous of four received. The oil switch which will be used to connect this feeder to the station bus will be furnished by the Canadian Westinghouse Company. Each pole of the switch will consist of two elements, the opening of one of which will interpose a reactance in series with the feeder before the second element opens the circuit. The action of this circuit breaker is similar to that of the two 110,000 volt line breakers referred to above, but in this case the two switches are constructed as a unit.

Building Extensions

Designs have been prepared and specifications issued covering an addition to present station which will be approximately fifty per cent. larger

than the existing building. The specifications are now in the hands of contractors and tenders will be received shortly. The new building will be sufficiently large to accommodate four banks of transformers of same capacity as those already in service and for stepping up to 110,000 volts with the requisite 12,000 and 110,000 volt switching equipment and switching and protective equipment for two additional 110,000 volt transmission lines. Space will also be provided in this building for four banks of transformers, each bank with a capacity of 10,500 kv-a. for stepping up from 12,000 volts to 46,000 volts for supplying power in the Niagara Peninsula, also for 12,000 and 46,000 volt switching equipment for these transformers and protective equipment for eight 46,000 volt lines. The length of the new building will be approximately the same as that of the present station, the arrangement of the high tension transformers and switching apparatus will be similar to that at present and the 12,000 volt switching equipment for the "high" as well as the "intermediate" tension transformers will be arranged similar to the existing apparatus. When the station is fully equipped there will be a line of possibly forty-two circuit breakers extending over a length of 360 feet. Space will be provided in the 110,000 volt switch-room for the lightning arrester tanks for two additional lines.

The "intermediate" tension transformers will be placed opposite the "high" tension transformers in the extension, across the track runway. The switching for these transformers will be placed on the main floor behind the transformers, whereas the 46,000 volt busses and lightning arresters will occupy a gallery extending over the transformers and oil switches. The 46,000 volt lines will leave the building from the opposite side to the 110,000 volt lines and will be carried on a steel structure around the south end of the building.

In place of individual terminal rooms for 12,000 volt feeders, all cables will terminate in one long room running the entire length of the new building. A basement is to be provided under the entire extension, thereby providing more room for transformer and switch piping than at present. It is intended to place the auxiliary equipment, such as water and oil pumps and oil filters, in the basement beneath the 46,000 volt oil switches.

Additional High Tension Equipment

Specifications were prepared, covering the manufacture and erection of a bank of three 3,500 kv-a. single phase transformers for transforming from 12,000 to 110,000 volts, also 12,000 and 110,000 volt switching equipment for same and switching and protective equipment for two additional 110,000 volt transmission lines, the equipment to be installed in the new station. Tenders were called and the contract awarded to the Canadian Westinghouse Company. The general arrangement of switching for the above equipment will be similar to that in the present building. Both the 12,000 and 110,000 volt busses shall be extended to connect to the busses required for the new equipment. The 12,000 volt feeder switches will be of the reactance type above referred to and the 110,000 volt line oil circuit breakers are to operate on the same principle. Protection for the new 110,000 volt equipment will be provided by two electrolytic arresters placed with the arrester elements inside the station and the horn gaps on steel sructures outside, the leads between the horns and the arrester elements entering the building through porcelain bushings, similar to those used for line wires. The tanks furnished with arresters will be "grounded."

"Intermediate" Tension Equipment

The equipment required for supplying 46,000 volt power which has been contracted for consists of two banks of three 3,500 kv-a. single phase transformers with 12,000 volt primaries and 26,400 volt secondaries; 12,000 volt switching equipment for each bank similar to that provided for "high" tension transformers, that is, feeder switch, bus switch and transformer switch with auxiliary bus, and six 46,000 volt oil circuit breakers, two for transformers and four for lines with electrolytic arrester protection for each line. Specifications describing the above equipment were issued and tenders asked for with the result that a contract was entered into with the Canadian General Electric Company for the transformers, and the Canadian Westinghouse Company for the switching and protective equipment.

The transformers will be connected in delta on the primary side and in star on the secondary side to give a line potential of approximately 46,000 volts.

The feeder switches on the 12,000 volt side and the 46,000 volt line breakers are to be of the reactance type and the arresters furnished will have "grounded" tanks, which is a feature that eliminates one of the dangers to which a station operator is often subjected, unless the apparatus is guarded by a screen or rail.

Dixon Street Conduit

At present all the 12,000 volt feeders are placed in one conduit system. To supply the extension it has been decided to construct an entirely independent duplicate line connecting the Commission's station with that of the Ontario Power Company. At the present time specificaions are being prepared for a duct line on Dixon Street. Tenders will be called for the construction of this line shortly, and contracts awarded so that construction may be well advanced before the coming winter.

Specifications were prepared and tenders asked for the supply and installation of six 300,000 c.m., 3-conductor paper-insulated and lead-covered cables for the new duct line. A contract has just been placed with the Canadian British Insulated Company for these cables. These feeders will be sufficient for supplying the transformers under contract, which were referred to above.

Dundas Transformer Station

Additional Feeders and Transformers

The 13,200 volt feeders, which were referred to in last report as having been contracted for, were installed and placed in service. The station now has six 13,200 volt feeders in operation and supplies Hamilton, Dundas, Waterdown, Dominion Sewer Pipe Company, Caledonia, Crown Gypsum Company, Hagersville, and Hamilton Asylum. The power demand of the City of Hamilton has increased to a sufficient amount to warrant the construction of two additional 13,200 volt lines, and, for the purpose of feeding these new lines, two more station feeder equipments are required. The Canadian Westinghouse Company are at the present time working on the manufacture of two Type "C" oil switches, two electrolytic arresters, with the full complement of disconnecting switches, choke coils and other auxiliary apparatus. The present 13,200 volt bus will be extended for the purpose of providing connection to the new feeders.

The six 1,250 kv-a. General Electric transformers, which were originally installed in Toronto station, but which were replaced last year by transformers

of larger capacity, were installed in Dundas Station, giving a rated installed capacity of 7,500 kv-a. The six 750 kv-a. transformers originally installed at Dundas have been removed and will be used elsewhere on the system.

Building Extensions

In order to provide space for the switching and protective equipment required for the new 110,000 volt line from Dundas to St. Thomas, and for the two contemplated 110,000 volt lines between Niagara Falls and Dundas, it was necessary that an extension be built to the high tension room. This extension is 90 ft. long and is constructed the full width of the present building. A basement has also been provided under one-half of the extension. The construction of the building is being carried out by Messrs. Wells & Gray, Toronto, they having submitted the most advantageous tender. This contract is practically completed

Dundas Transformer Station

110,000 Volt Extensions

The following equipment, to be supplied and installed by the Canadian Westinghouse Company, will be used in conjunction with the new line to St. Thomas and the two new lines from Niagara Falls.

For the new line to St. Thomas will be supplied a 110,000 volt automatic circuit breaker, 110,000 volt disconnecting switches for connecting to each bus, and a set of lightning arresters. The arrester tanks (grounded type) will be placed inside the station and the horn gaps on special structures outside. An oil switch is also being supplied which will be used for connecting the two 110,000 volt busses.

Two sets of circuit breakers, disconnecting switches and lightning arresters will be furnished for the contemplated double circuit line from Niagara Falls.

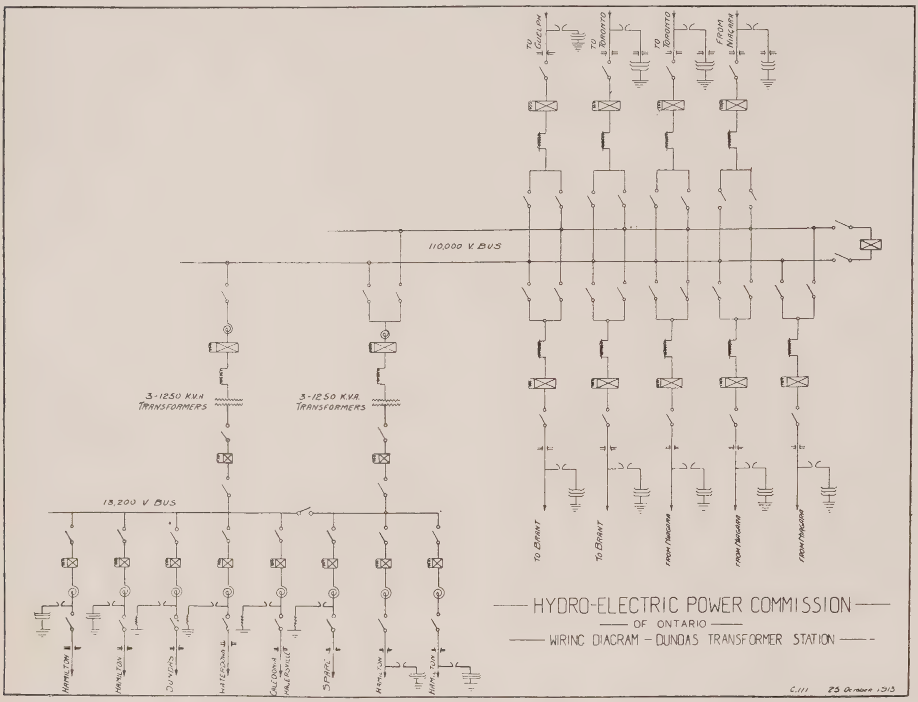
Waterdown Distributing Station

An additional 2,200 volt feeder panel was installed at the station and at the present time an automatic oil switch controls each of the loads, namely, that of the Village of Waterdown and that of the Dominion Sewer Pipe Company.

Hagersville Distributing Station

A standard 13,200/2,300 volt distributing station, housing three 75 kv-a. transformers, was constructed and equipped in the Village of Hagersville. The building was constructed by Mr. George Smith, a local contractor, and the equipment was manufactured and installed by the Canadian Westinghouse Co.

At the present time only one 13,200 volt line enters the station, but the arrangement of equipment is such that at any time, should the load or service require it, an extra line can be brought into the station. At the present time there is one 2,300 volt delta connected feeder for the Village of Hagersville.



Wiring Diagram Dundas Station

Corporation of Dundas

The power demand of Dundas increased to such an extent that the three 75 kv-a. transformers installed in our station were insufficient. Acting under the instructions of the Corporation, tenders were called covering the supply of three 150 kv-a. single phase transformers, 13,200 volts primary, 2,300/575 volts secondary. The tenders when received were tabulated and recommendations sent to the Town with the result that contract was awarded to the Canadian Westinghouse Company. This contract covers the installation of the equipment. The three 75 kv-a. units will be used elsewhere in the system and the Town to be credited with their present value.

City of Hamilton

Designs for a sub-station in the west end of the City of Hamilton were prepared and submitted to the Hamilton Hydro-Electric Department. A site for this station was selected on Dundurn Street near Hunt Street. This station was designed to provide for four incoming 13,200 volt overhead lines from the

Commission's Dundas transformer station and for five outgoing overhead 13,200 volt feeders, one being the Asylum feeder, and for six underground 13,200 volt feeders, also for two banks of transformers, each consisting of three 400 kv-a. 13,200/2,300/575 volt single phase, self-cooled transformers. The 13,200 volt feeders are designed to feed other sub-stations in the city. Provision was also made in the design for a number of 2,300 volt feeders to supply the western part of the city.

Designs for a central sub-station on Hughson Street were submitted to us by the Hamilton Hydro-Electric Department and were discussed and commented upon.

Toronto Transformer Station

Seven 2500 Kv-A. Transformers

The seven 2,500 kv-a. transformers which were referred to in the last report as having been purchased from the Canadian General Electric Company, were installed and placed in service in the early winter. The installed capacity of this station is now 15,000 kv-a. and a spare unit is provided which may be used in case of emergency. The six 1,250 kv-a. single phase transformers originally installed in this station have been transferred to Dundas transformer station.

Building Extension

Designs were prepared for a building extension to the Toronto station sufficiently large to accommodate three additional banks of transformers, also the equipment which the Toronto Hydro-Electric System will require for supplying low voltage power in the vicinity of the transformer station. Specifications for this building were drawn up and tenders asked with a result that Messrs. Wichall & Son of Toronto were awarded the contract. At the present time the walls are about three-quarters completed. The steel work is delivered at the site. It is expected that the building will be completely enclosed before the winter weather sets in.

Additional Capacity

The Canadian General Electric Company has been awarded the contract for the supply and installation of three 2,500 kv-a. single phase transformers, these to go into the new portion of the building. The contract also covers one 110,000 volt oil switch, disconnecting switches and extension to the present bus for connecting the new equipment. This contract also includes the necessary 13,200 volt switching equipment for the bank of transformers, also an additional switchboard panel. It is expected this equipment will be completely installed and in operation next spring.

City of Toronto

A portion of the Toronto Transformer station is occupied by equipment, the property of the Toronto Hydro-Electric System, and as it was the intention of this System to install a considerable amount of transforming and switching apparatus in the new portion of the building, the layout of the station extension was made wih due regard to the housing of same.

London Transformer Station

Building Extension

In order to house the switching equipment required in connection with the new 110,000 volt line from Dundas to St. Thomas, it was necessary to construct an extension to the high tension portion of the London transformer station. Designs were prepared and tenders called for the construction of this building with a result that Messrs. Hyatt Bros., of London, were awarded the contract. The main walls are now practically completed and the structural steel work is in place. We expect this building will be completely housed in the course of a month.

110,000 Volt Extension

The equipment required for this station for the operation of the new 110,000 volt line consists of one automatic 110,000 volt oil circuit breaker for connecting London station to the new line from Woodstock and a similar breaker for connecting the new line to St. Thomas. With these new circuit breakers are required a certain amount of bus bar, connecting material and a number of disconnecting switches. 110,000 volt lightning arresters are also required, one each for protecting the new line from Woodstock and the new line from St. Thomas. The Canadian Westinghouse is under contract to supply and install all this equipment.

Dorchester Distributing Station

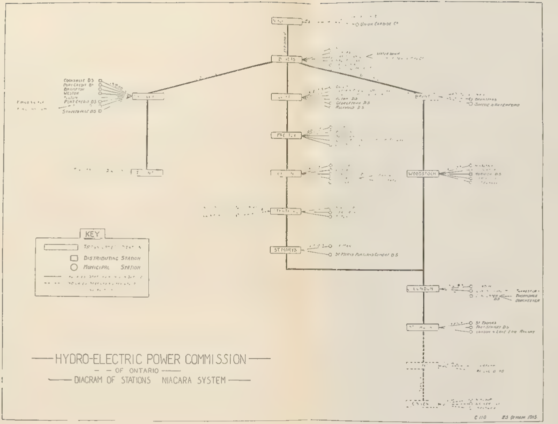
Work has been started in connection with the construction of the distributing station at Dorchester, similar to the outdoor station at Rockwood. The Canadian Maloney Company have contracted to supply three 25 kv-a. single phase outdoor type transformers. This station will be used for supplying power to Dorchester, Thamesford, and Thorndale.

Guelph Transformer Station

No additions have been made to this transformer station during the past year. However, it is intended to install in the station the four 750 kv-a. transformers which were removed from Dundas and to transfer the four present transformers, two to Preston Transformer Station and two to Berlin Transformer Station, thereby doubling the capacity of each of the two latter stations. This change will increase the capacity of Guelph station, as the four transformers originally placed in Dundas have a capacity in excess of their rating.

Central Prison Farm

Recommendations were made to the Provincial Secretary for the purchase of equipment required for the construction of a sub-station at the Central Prison Farm for receiving Hydro-Electric power, with a result that three 100 kv-a. single phase transformers were purchased from the Canadian Crocker Wheeler Company and switching and protective equipment from Messrs. Chapman and Walker. The installation of the transformers and other equipment was carried out by the Hydro-Electric construction staff. The building in which this equipment is installed is of a temporary nature, it being the intention of the Provincial Secretary to construct a permanent power house at a later date and at that time the transforming equipment will be installed in the new building along with other equipment which may be found necessary.



Union Carbide Co
Cooksville DS
Port Credit
Brampton
Weston
Port Credit DS
Streetsville DS
Georgetown DS
Rockwood DS
Brantford
Simcoe & Waterford
Woodstock
St Marys
St Marys Portland Cement DS
KEY
Distributing Station
Municipal Station
London
Thamesford
Thorndale
Dorchester
St Thomas
Port Stanley DS
London & Lake Erie Railway
HYDRO-ELECTRIC POWER COMMISSION
OF ONTARIO
DIAGRAM OF STATIONS NIAGARA SYSTEM
C 110
23 October 1913

Acton Distributing Station

The station in the Village of Acton which was referred to in the last report was completed and placed in service the early part of the winter.

Village of Acton

A constant current transformer was purchased for the Village of Acton for use on their street lighting system. This transformer was installed in the Acton Distributing Station.

Georgetown Distributing Station

A standard distributing station equipped with three 75 kv-a. transformers was constructed in Georgetown on a site provided by the Town adjoining the town hall. The contract for the building was awarded to J. MacKenzie, a local contractor. At the present time only one 13,200 volt line enters this station, but the arrangement is such that a second line can be added when required. The secondary portion of this building is equipped with two panels, one for power and one for lighting. The secondary voltage of this station is 4,000 volts "Y" connected. The three 75 kv-a. transformers and switching equipment were supplied and installed by the Canadian Westinghouse Company.

Rockwood Distributing Station

A pole type sub-station was constructed in the Village of Rockwood, three 25 kv-a. outdoor type, single phase, Canadian General Electric transformers were mounted on a platform supported by wooden poles. They are connected to the line through horn gap disconnecting switches and 13,200 volt fuses. This is the first outdoor 13,200 volt transformer station on the system.

Preston Transformer Station

Breslau Distributing Station

A standard distribution station was constructed in the Village of Breslau on the property of the Breslau Brick Company. Messrs. Stagg and Erb, of Berlin, Masonry contractors, constructed the building, and the equipment which was similar to that of Georgetown Distributing Station was supplied and installed by the Canadian Westinghouse Company.

Town of Preston

Specifications were prepared and issued and tenders received covering an additional bank of three 170 kv-a., single phase, 6,600/13,200-2,200/550 volt, 25 cycle, self-cooled transformers for the Preston Municipal Station, also switching equipment for same, including connections to former bank, and for one outgoing line to Doon. This equipment was purchased from the Canadian General Electric Company and was installed for the Town of Preston by the Commission and placed in service August, 1913. In order to install the new equipment in the available space, it was found necessary to rearrange the wiring of the former installation.

Town of Galt

The switching equipment purchased for the Corporation, which was referred to in the last report, was installed and placed in service early in the year.

The local Commission was assisted in the purchase of three 150 kv-a., 6,600/2,200 volt, single phase transformers, which will be installed in the main sub-station of the Corporation. With these transformers in service the main station capacity will be double what it was originally.

The pumping equipment referred to in last report as having been purchased, was installed and placed in service.

Berlin Transformer Station

Neutral Grounding Device

Water resistance for grounding the High Tension neutral of the transformer bank was installed similar to that in use at Niagara Falls, Toronto and St. Thomas.

Building Extension

Drawings were prepared covering an extension to the Berlin station of sufficient size to house an additional bank of three 750 kv-a. single phase transformers. The spare transformer already at this station will be used for one of three required for the second bank, whereas the other two transformers will be obtained from Guelph Transformer station. Tenders were called for the construction of the building and the contract awarded to Mr. Casper Braun, of Berlin.

110,000 Volt Extension

The Canadian General Electric Company was awarded the contract for the supply and installation of an additional 110,000 volt transformer oil switch with necessary disconnecting switches and extensions to the present bus for connecting to the new transformer switch. Their contract also covers one 13,200 volt transformer oil switch and two 13,200 volt feeder equipments, consisting of oil switch, electrolytic lightning arresters, switchboard panels and meters.

City of Berlin

Specifications were prepared and tenders received covering the supply and installation of three 250 kv-a. 13,200-2,300/575 volt, single phase, self-cooled transformers and 13,200 volt switching equipment for same and for one incoming line for the Berlin Light Commission for a sub-station at the plant of the Dominion Tire Company, in Berlin. In connection with this work, the drawings of the building which was built by the Dominion Tire Company were commented on and approved by us. The contract for the transformers and other equipment outlined above was awarded by the Corporation, on the Commission's recommendation, to the Canadian General Electric Company.

Baden Distributing Station

The power demand on this station increased at such a rate that the transformers originally installed in this station, namely three 20 kv-a. units, were insufficient to take care of the demand, with a result that three 75 kv-a. transformers were purchased from the Packard Electric Company and installed in this station. The construction work involved in making the change was performed by the Commission's construction force.

New Hamburg Distributing Station

As the Commission has established the practice of purchasing the necessary equipment in stations, supplying power to villages, arrangements were made

whereby the Commission took over the equipment originally purchased by the Village of New Hamburg and installed in the local station. This station is equipped with three 75 kv-a. Packard transformers stepping down from 13,200 to 2,200 volts.

Elmira Distributing Station

A standard distributing station was constructed at Elmira on a lot adjoining the local municipal station. J. E. Bowman, a local contractor, constructed the building. The transformers, which are rated at 75 kv-a., 13,200/2,300 were supplied and installed by the Canadian Westinghouse Company, whereas the 13,200, and 4,000 volt switching equipment will be supplied by the Canadian General Electric Company.

Stratford Transformer Station

Building Extension

Drawings were prepared covering an extension to Stratford station of sufficient size to accommodate one bank of three 1,250 kv-a. transformers stepping down from 110,000 volts to 26,400 volts, also a spare transformer unit. The extension will also be required to accommodate one 110,000 volt transformer oil switch, 26,400 volt transformer oil switches, and equipment for four 26,400 volt feeders. Specifications have been issued and tenders requested for the construction of this building. Construction work will be started before the coming winter.

110,000 Volt Extension

The Canadian Westinghouse Company is under contract to supply and install the four 1,250 kv-a. single phase, water cooled transformers stepping down from 110,000 volts to 26,400, whereas the Canadian General Electric Company are under contract to supply and install the 110,000 volt oil switch required for the transformers, also disconnecting switches and extension to the present high tension bus. The latter firm will also supply a 26,400 volt transformer oil switch, 26,400 volt bus bars, four feeder switches, four electrolytic lightning arresters and the necessary switchboard and apparatus. Provision will be made in this station whereby 13,200 volt power can be obtained from the new bank of transformers for supplying the stations equipped for receiving 13,200 volt power should any trouble occur to the transformers at present in service.

Town of Goderich

Specifications for electrical equipment for the Goderich Municipal Station were prepared and tenders received and a recommendation submitted to the Corporation of Goderich. The contract was awarded to the Canadian General Electric Company for the following equipment:—

One bank of three 250 kv-a., 25 cycle, single phase self-cooled 26,400/13,200-2,300/575 volt transformers.

One 3 phase regulator switch connected to the secondary taps of above transformers to regulate voltage from 2,200 volts to 2,500 volts in 100 volt steps.

Two 15 kw. 6.6 amp., 25 cycle constant current transformers.

Switching equipment for one incoming 26,400 volt incoming line; the above transformers; one 600 kv-a. power feeder; one 250 kv-a. 3 phase lighting feeder; and two series lighting feeders.

The above equipment is to be installed in the building at present housing the Corporation power generating equipment, the necessary alterations being made thereto in accordance with the Commission's plans.

For the Corporation, specifications were also prepared for the purchase of a domestic pump and a fire pump having respectively a capacity of 700 Imperial gallons per minute against 340 foot total head, and of 1,450 Imperial gallons per minute against 480 foot total head, both pumps being directly connected to a synchronous motor suitable for power factor correction purposes. The specifications covered friction clutches, piping, switchboard and all accessories. Tenders have been received but no contract has been awarded pending further investigation and study. It is the intention to place these pumps in a room adjoining the room in which the main transformers and switchboard will be located.

Goderich Metering Equipment

Equipment, consisting of a recording wattmeter and a recording power factor meter, was purchased for metering load conditions at Goderich. This equipment is being supplied by the Canadian General Electric Company and will be installed at Goderich Municipal Station at the time this Company is installing the equipment for the Corporation. The meters will be connected on the secondary side of the transformers.

Town of Clinton

Specifications were prepared for sub-station equipment for the Town of Clinton and tenders received and a recommendation submitted to the Corporation. The contract was awarded to the Canadian General Electric Company for equipment consisting of:—

Three 150 kv-a., 26,400/13,200-2,300/575 volt, 25 cycle self cooled transformers.

Switching equipment for above and for two incoming 26,400 volt lines, and for one 300 kv-a. power feeder and one 150 kv-a. lighting feeder.

This equipment is due for shipment in December, 1913, and will be in service early in 1914. It will be installed by the Canadian General Electric Company in the building at present housing the producer gas plant, in Clinton.

Specifications have also been prepared and tenders have been received for one 150 kv-a., 750 r.p.m., 2,300 volt, 25 cycle, three phase, belted type synchronous motor with panels and connecting material. It is proposed to install this motor in the present power house and use it to drive a line shaft and also for power factor correction purposes.

Cinton Metering Panel

Equipment, consisting of a recording wattmeter and a recording power factor meter, was purchased for metering load conditions at Clinton. This equipment is being supplied by the Canadian General Electric Company and will be installed at Clinton Municipal Station at the time this Company is installing the equipment for the Corporation. The meters will be connected on the secondary side of the transformers.

Woodstock Transformer Station

The only construction work in Woodstock transformer station undertaken during the present year consisted of the installation of wiring and conduit for a 2,200 volt feeder supplying the West Oxford Rural Line. Power is obtained from the transformers in the station belonging to the Corporation of Woodstock.

St. Thomas Transformer Station

Construction work in connection with the installation of the 13,000 volt oil switch with panels, meters and auxiliary equipment for the line to the London and Lake Erie Railway and Transportation Co., was completed and placed in service.

Building Extension

In order to accommodate the switching equipment required in the new 110,000 volt single circuit from London, and also for the new double circuit line being constructed to Windsor, it is necessary to construct a 32 foot extension to the high tension portion of the building. The necessary designs and specifications were prepared. Tenders were called for the construction of this building and contract awarded to George Ponsford, a local contractor. The main building walls are about three-quarters completed and some of the steel work is already erected. The building will be completely enclosed before the cold weather sets in.

110,CCO Volt Extension

The equipment required for this station for the operation of the new 110,000 volt lines consists of one automatic 110,000 volt oil circuit breaker for connecting St. Thomas station to the new line from London, two similar breakers for connecting the new double circuit line to Kent station (Chatham), also one transformer bank automatic oil circuit breaker. With these new circuit breakers is required a certain amount of bus bars and connecting material, also a number of disconnecting switches. 110,000 volt lightning arresters are also required, one each for protecting the new lines to Kent station and the new line from London station. The arrester tanks are grounded type and will be located inside the station and the Horn Gaps on steel structures outside. The Canadian Westinghouse is under contract to supply and install all this equipment.

City of St. Thomas

Designs and specifications for a sub-station in the southern part of the City of St. Thomas were prepared for the St. Thomas Light and Power Department. Tenders were received for the electrical equipment, and recommendations were submitted to the Department. Contract was awarded to the Packard Electric Company for three 150 kv-a., 13,200-2,300/575 volt, oil insulated, self-cooled transformers; to the Siemens Company, of Canada, for one three phase, 13,200 volt oil immersed, resistance type lightning arrester; and to the Canadian General Electric Company for switching equipment for the above transformers and for one incoming 13,200 volt line, one 450 kv-a. 2,300 volt power feeder, and one 100 kv-a. three phase 2,300 volt lighting feeder.

Tests on the transformers were witnessed by one of the Commission's Engineers and two of the transformers have been shipped. The arresters have been shipped and the switching equipment will be shipped in November.

The building was erected by the Corporation and the station will distribute power and lighting to customers in the vicinity.

Cooksville Transformer Station

13,200 Volt Extension

This station was originally equipped with only four 13,200 volt feeders; however, the demand on this station has been such that it is necessary to double the number. A contract has been awarded to the Canadian Westinghouse Company for the supply and installation for four 13,200 volt feeder equipment, each consisting of an automatic oil switch, an electrolytic arrester (grounded tank type), disconnecting switches, choke coils, switchboard panel and full complement of indicating and recording meters. The construction of the necessary cell work is well advanced and the Canadian Westinghouse Company has started installation of the equipment which will be completely installed by the coming winter.

Mimico (New Toronto) Distributing Station

The installation of equipment in the station was completed and the station placed in service early in the year. The apparatus in this station is protected on the 13,200 volt side with an arrester developed by the Commission, the arrester being of the horn gap and oil cooled resistance type. The 2,300 volt feeders run to the Village of Mimico and to the Mimico Asylum for the Insane.

Port Credit Distributing Station

The installation of equipment was completed and the station placed in service early in the year. The Village of Port Credit, and Toronto Township, County of Peel, are served from this station.

Mimico Hospital for Insane

At the request of the Department of Public Works, specifications were prepared and tenders received for electrical equipment for the Mimico Hospital for Insane. Recommendations were submitted to the Department and contracts were awarded to the Canadian General Electric Company for three 25 kv-a., one 7½ kv-a. and one 1 kv-a. single phase, 2,200-220/110 volt, 25 cycle, transformers; and to the Northern Electric and Manufacturing Company for a six panel distributing switchboard. The switchboard provides for one incoming 2,300 volt line, one bank of three 25 kv-a. transformers, one 2,300 volt feeder to the pump house, one 2,300 volt feeder to the Asylum farm, two 30 kw. d.c. 115 volt generators (previously installed), three 220 volt, 3 phase, power feeders; eight 110 volt single phase lighting feeders, two 220/110 volt single phase ground lighting feeders. The lighting feeders are so arranged that they may be connected either to the transformers or to the direct current generators.

The switchboard is being erected in present generator room at the asylum, and the three 25 kv-a. transformers are erected on a two pole structure outside the building. The 7½ kv-a. and the 1 kv-a. transformers are for lighting of the Assembly Hall and the pump house respectively. A turbine fire pump direct connected to an induction motor has been installed by the Department in the Asylum and a turbine pump for domestic service is about to be installed. Three 5 kv-a., 2,200/220/110 volt transformers have been purchased from the Packard Electric Company for operating the domestic pump motor.

Mimico Asylum Farm

At the Asylum farm situated approximately one and a half miles north of the Asylum, a brick plant has been erected by the Provincial Secretary. The Commission, at the request of the Public Works Department, have built a 2,300

volt feeder from the Asylum to the farm and, at the request of the Provincial Secretary's Department, called for tenders on one 100 h.p. and one 75 h.p., 3 phase, 750 r.p.m., 550 volt, 25 cycle induction motor, also three 50 kv-a., 2,200-550 volt, 25 cycle outdoor type transformers. Recommendations were submitted to the Assistant Provincial Secretary and contracts were awarded to the Canadian Crocker Wheeler Company for the motors and to the Packard Electric Company for the transformers. One 5 kv-a. and one 3 kv-a. 2,200-220/110 volt transformers were also purchased from the Canadian Crocker Wheeler Company for use in lighting the buildings at the brickyard plant. The above motors and transformers with wiring were installed by the Commission for the Department and were placed in service in September.

Corporation of Milton

As stated in previous report, recommendations were made to the Corporation regarding purchase of sub-station equipment. The Town approved the recommendations made, with the result that contracts were drawn up with the Canadian General Electric Company for three 250 kv-a. single phase, oil insulated, self cooled single phase transformers for stepping down from 13,200 to 2,300 volts, and with the Siemens Company, of Canada, for the requisite switching and protective equipment. The Town's equipment was installed in the power house of a local manufacturer. The equipment has been in service for several months.

Milton Metering Panel

A recording wattmeter and a recording power factor meter with the requisite current and potential transformers for metering at 13,200 volts was purchased by the Commission from the Siemens Company, of Canada, for metering the Milton load. This equipment was installed by the Siemens Company when installing the Corporation's equipment.

Streetsville Distributing Station

A standard 13,200 volt distributing station was built at Streetsville on the property of the village. Three 75 kv-a. transformers were purchased from the Canadian General Electric Company for this station. They will be installed by the Commission. The switching equipment has been ordered from the Canadian Westinghouse Company. The installation of switching equipment is now in progress by the Westinghouse Company. The distribution voltage from the station is 4,000, star connected with the neutral grounded. The building was constructed by a local contractor, Joseph P. Lair.

Brant Transformer Station

This station is being constructed between the City of Brantford and Paris, and will be used to serve both municipalities as well as any other Corporation in the vicinity who contract with the Commission for a supply of power. The secondary voltage of this station being 26,400, it will be possible to distribute power as far south as the Town of Simcoe. It is expected to place this station in service about the end of the present calendar year.

Building

Last November, specifications were prepared and tenders requested for the construction of the sub-structure necessary for this transformer station, with the result that Messrs. Bennett and Bowden were awarded the contract on the understanding that work would be expeditiously carried out to ensure completion before the winter. During the winter specifications covering the superstructure were prepared and separate tenders called for, one covering the supply and erection of the structural steel work and the other the masonry, concrete and general fittings, such as doors, glazing and painting. John Hayman and Sons, of London, were awarded the contract for the masonry work and the Standard Steel Construction Company for the structural steel work. The structural steel contract was completed some time since, whereas John Hayman and Sons expect to complete their contract in the course of two or three weeks.

Electrical Equipment

The arrangement of this building is such that the existing line between Dundas and Woodstock, being cut at the station, will enter the building and pass through an oil circuit breaker on to the bus and then will pass out through a circuit breaker on to the line, both the incoming and outgoing lines being provided with electrolytic arresters. The transforming equipment for this station is to consist of four 1,250 kv-a. single phase, oil insulated transformers, three of which will be connected in the bank in star on the high tension side and in delta on the low tension side, the fourth transformer being connected to an emergency bus as a spare unit.

The arrangement of the 110,000 volt equipment is in general the same as that in the Cooksville (Port Credit) Transformer station, with the exception that at Brant the lighning arrester tanks will be placed inside the building. There will be six 26,400 volt feeders, each protected with an electrolytic arrester of the grounded tank type. The Canadian Westinghouse Company has the contract for the supply and installation of the entire electrical equipment for this station.

This station will be the first one in the system with a distribution voltage of 26,400. On account of this higher secondary voltage, a new arrangement of equipment was required. In Brant station there will be two galleries in the 26,400 volt portion. The lower gallery will accommodate the feeder and transformer switches, also the bus bars and current transformers. The upper gallery will accommodate the electrolytic lightning arresters. The space below the gallery will be completely enclosed and in this space shall be the switchboard. In this station no provision is being made for the heating of the building by steam, it being the intention to heat the building electrically, distributing 10 kw. electric radiators sufficient to maintain the temperature from 65 deg. fahr. in the operating room to 50 deg. fahr. in the balance of the building under the worst weather conditions likely to be encountered. During the peak the radiators will be cut off.

Mechanical Equipment

A 45-ton crane with electric and hand hoist and a transformer truck for this station are being manufactured by H. J. Armstrong, of Markdale. The oil storage tanks were furnished by Goldie and McCulloch, of Galt, and the transformer circulating water pumps are being supplied by the Storey Pump and

Equipment Company, Toronto. A well was dug in the basement of the station, which will supply sufficient water for replenishing the sprinkling tank which will be constructed in the rear of the station.

City of Brantford

The City of Brantford Hydro-Electric Department submitted building drawings and a proposed wiring diagram for a municipal station in Brantford, and requested the Commission to prepare electrical designs and specifications and award contracts for the necessary equipment. Tenders were received and a recommendation made to the Corporation. Contracts were awarded to the Canadian Crocker Wheeler Company for two 750 kv-a. 26,400-13,200/4,000-2,300 volt, 25 cycle, water cooled, three phase transformers; and to the Canadian General Electric Company for switching and protective equipment for the above transformers; two incoming 26,400 volt lines, three 4,000/2,300 volt 4 wire, three phase lighting feeders, three 4,000/2,300 volt, 4 wire, three phase power feeders, and one 4,000/2,300 volt, 4 wire, three phase feeder to the constant current street lighting transformers. In each case the contract covers the supply and installation of the equipment. This system will provide for general distribution for power and lighting in the City of Brantford.

Town of Paris

Specifications were prepared and tenders received covering the supply and installation of electrical equipment for a municipal station in the Town of Paris. A recommendation was submitted to the Corporation and the contract was awarded to the Canadian General Electric Company for equipment as follows:—Three 200 kv-a., 26,400-13,200/2,200-575 volt, 25 cycle, oil insulated, self cooled transformers: Three 15 kw., 6.6 amp., 25 cycle constant current transformers: Switching equipment for the above and for two incoming 26,400 volt lines; one 600 kv-a., 2,300 volt power feeder; three 150 kv-a., 2,300 volt three phase lighting feeders; and three series street lighting feeders.

This equipment will be installed in the existing power house, the alterations to which are being made by the Corporation in accordance with the Commission's drawings.

Kent Transformer Station

This is the station which is being constructed near the City of Chatham and will be used to serve the City of Chatham as well as any other municipality within a range of sixty miles or so which enters into a contract with the Commission for the supply of power.

Building

Designs were prepared and specifications gotten up covering the construction of the building necessary to house the electrical apparatus mentioned below with the result that the contract was awarded to H. G. Christman & Co., of Hamilton. Excavation work was started during the latter part of September, but the Contractor promises to have the building completed by the middle of January next.

Electrical Equipment

The arrangement at this station is such that both the 110,000 volt lines from St. Thomas shall enter the station and be connected with the main bus by automatic oil circuit breakers. Two outgoing lines to Essex Station (near Windsor) will also be provided with similar breakers. Both the two incoming

and two outgoing high tension lines will be protected by electrolytic arresters. The transformers which are being manufactured for this station will have a capacity of 1,250 kv-a. There are four transformers ordered—three of these will be connected in star on the high tension side and in delta on the low tension side. The fourth transformer shall be reserved as a spare. There will also be six 26,400 volt feeder equipments provided, these being protected by electrolytic arresters.

Essex Transformer Station

This station is being erected at Walkerville Junction, and will be used to serve Walkerville, Windsor, Sandwich and surrounding municipalities.

Electrical Equipment

This station is at the end of the 110,000 volt line and will be arranged so that both the 110,000 volt lines from Kent Transformer station will enter the building and pass through automatic oil circuit breakers to the bus bars, these lines being protected by electrolytic arresters. The transforming equipment is to consist of four 2,500 kv-a. single phase, oil insulated water cooled transformers, three being connected in a bank in star on the high tension side and in delta on the secondary side to give a distributing potential of 26,400. Six 26,400 volt feeder equipments will be installed. The entire electrical equipment is being manufactured by the Canadian Westinghouse Company. They guarantee to completely install same and have it ready for service by March 1st, 1914.

Building

Plans and specifications were prepared covering the necessary building for housing the above equipment. Tenders were called with the result that the contract was awarded to H. G. Christman & Co. of Hamilton. Excavation work has just recently been started, but the Contractor promises to have the building completed by the middle of January.

Severn (Simcoe) System

Penetanguishene Distributing Station

Owing to the increasing demand for power from this station it was decided to increase the capacity. A contract was entered into with the Canadian Crocker Wheeler Company for a 200 kv-a., single phase, 60 cycle, 2,300 volt transformer with characteristics similar to those of the transformers originally supplied. This transformer has been installed and the present station capacity is 600 kv-a.

Barrie Distributing Station

The apparatus referred to in last report as having been purchased was installed in the existing power station belonging to the Corporation, and placed in service. There are two 350 kv-a. transformers in this station connected for 2,300 volts 2 phase.

The potential regulators and feeder panels referred to in 1912 report were delivered and turned over to the Corporation who in turn arranged with the Canadian General Electric Company for its installation. The equipment was placed in service in the spring of 1913.

Collingwood Distributing Station

The station in this town has been completed and placed in service. It has a capacity of 750 kv-a., while the secondary distribution system operates at 2,300 volts three phase.

Corporation of Collingwood

The contract for equipment for Collingwood Station referred to previously, included constant current transformers for the street lighting and power and feeder panels, for the Corporation, as well as automatic three phase potential regulators. This equipment has all been placed in service and turned over to the municipality.

Coldwater Distributing Station

This station was completed and placed in service.

Elmvale Distributing Station

The Canadian Westinghouse Company was awarded the contract for the transformers and switching equipment which consisted of three 75 kv-a. single phase transformers, switching equipment for one 22,000 volt incoming line and one 2,300 volt outgoing feeder. Siemens Company of Canada supplied the 22,000 volt protective equipment. The building was constructed by L. H. Spring, a local contractor. This station is practically the same as that at Coldwater and was placed in service several months ago.

Stayner Distributing Station

The Canadian Westinghouse Company supplied equipment for this station similar to that provided for Elmvale, with the exception that the transformers are rated at 100 kv-a. Siemens lightning arresters and choke coils were provided for 22,000 volt protection. The building was constructed by H. G. Wynes, a Collingwood contractor, on a site provided by the municipality. The distribution voltage from Stayner station is 4,000 three phase, star connected, with neutral grounded.

Wasdell's Falls Generating Station

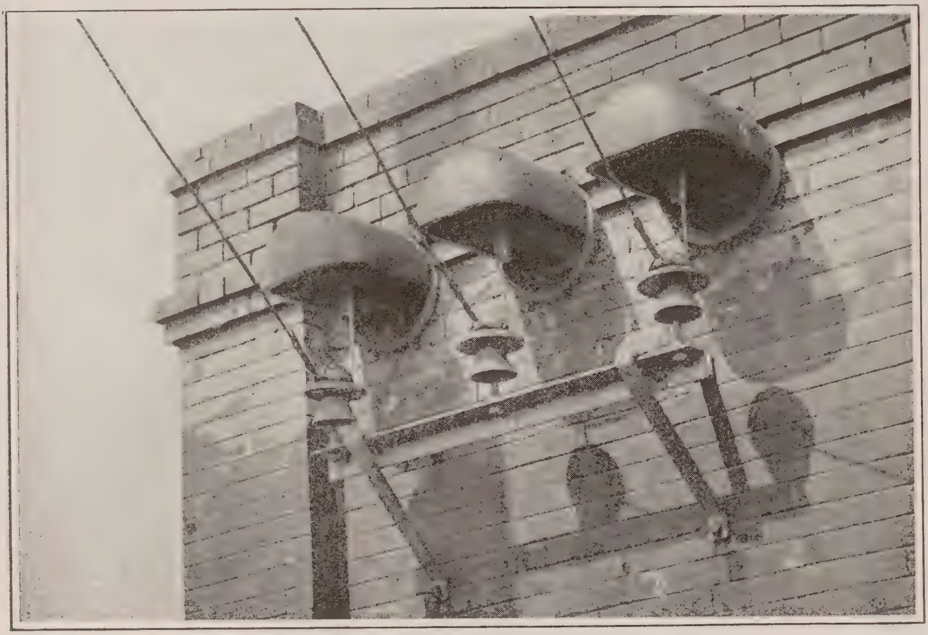
Specifications were issued in May covering complete electrical equipment for the development at Wasdell's Falls on the Severn River. After due consideration of the tenders which were received the contract for the generators and exciters was awarded to the Swedish General Electric Co., through their agents Messrs. Kilmer, Pullen and Burnham. The contract for the transformers and the complete switching equipment was awarded to the Canadian Westinghouse Co.

A description of the electrical equipment which has been contracted for and the installation is given below.

There will be two vertical type 400 kv-a., 3 phase, 60 cycle, 2,300 volt, 90 r.p.m. generators, each direct connected through a flexible coupling with a water wheel and each provided with a ball thrust bearing at the top of the generator frame. This bearing will carry only the weight of the generator rotating parts. These generators have a 25 per cent. overload guarantee and are also guaranteed to withstand a test of 180 per cent. of normal speed for fifteen minutes with full excitation, also a short circuit at the terminals for one minute with the same excitation without injury to any part.

Two compound wound, 125 volt, exciters will be provided, one being turbine driven and the other motor driven. The turbine driven exciter is rated at 20 k.w., 190 r.p.m. and is capable of exciting both generators. The motor driven exciter is rated at 30 k.w., 1,200 r.p.m. and is on same base with and direct connected to a 45 h.p., 3 phase, 60 cycle, 220 volt squirrel cage induction motor. Both exciters are being designed to be suitable for use with a Tirrill voltage regulator.

There will be two banks of transformers, each consisting of three 150 kv-a. single phase, self cooled, oil insulated transformers with high tension voltages of 22,000, 23,000, 24,000 and 25,000 volts and with low tension voltages of 2,300, 2,200, 2,100, 2,000 and 1,900 volts. A spare transformer is also being supplied.



Standard 13,200 Volt Entrance Hoods

In addition to above transformers there will be three 15 kv-a., 2,300/220-110 volt, single phase service transformers for use in supplying motor for driving exciter and for station lighting.

The switchboard will consist of seven panels of black slate, there being two generator panels, two exciter panels, one station service panel and two combined transformer and outgoing line panels. The 2,300 volt bus bars and oil switches will be mounted on a separate framework, a short distance behind the panels. The two outgoing high tension transmission lines will be controlled by Westinghouse automatic Type "E" 25,000 volt oil switches in the gallery, operated from the switchboard on main floor. There will be an aluminum cell lightning arrester installed for each of the two lines.

The scheme of connections is such that the station may be operated in two parts if required, since each bus is divided by disconnecting switches into two sections with one exciter, one generator, one bank of transformers and one transmission line on each section.

Port Arthur System

Port Arthur Station

Station Extension

Drawings were prepared covering an extension to the north end of the existing station, the additional section having sufficient space to accommodate a bank of transformers, two 22,000 volt lines, a 750 kv-a. motor generator and additional 2,200 volt and 600 volt feeder equipments. The contract for the building extension was placed with Messrs. Siemen and Penniman, a local contracting firm. The building was completed some time ago.

Siemens Company, of Canada, entered into a contract to supply and install switching, protective and metering equipment for the two main 22,000 volt lines which will be used for supplying power to the Dominion Grain Commission Elevator and to the contemplated Municipal pumping station at the north end of the city. The installation of this equipment has been commenced and should be completed in the course of a month or so.

Corporation of Port Arthur

Tenders were asked of the different electrical manufacturers covering transformers and switching equipment for two local sub-stations. The tenders on receipt were tabulated and sent to Port Arthur with recommendations. Apparatus required by the Corporation was ordered direct from the manufacturers.

St. Lawrence System

Prescott Distributing Station

A standard 26,400 volt distributing station was constructed at Prescott on a lot adjoining the existing Municipal power station. The building, which is similar to that at Stayner, was constructed by H. G. Wynes, of Collingwood. The electrical equipment, consisting of three 150 kv-a. single phase transformers, 26,400 volt primary, 2,300 volt secondary, also switching equipment for one 26,400 volt line and two 2,300 volt feeders, is being supplied and installed by the Canadian General Electric Company. The 26,400 volt protective equipment was furnished by Siemens Company of Canada.

Rapids Power Company (Morrisburg)

Assistance was given this company in connection with the purchase of equipment for its step-up transformer station at Morrisburg for stepping up the voltage to 26,400 for transmission to Prescott and other municipalities in the district.

General

Toronto Storehouse (Building)

This building which was completed and placed in service in the spring of 1913, consists of three stories and a basement, and has a gross floor area of approximately 28,000 square feet. The general arrangement of the building is as follows:—

Basement—Machine shop, stores and laboratory.
Main Floor—Office, garage, shipping and receiving room and laboratory.
Second Floor—Stores and laboratory.
Third Floor—Stores.

Laboratory Equipment

Tenders were requested covering the supply of miscellaneous laboratory equipment consisting of three 50 kv-a. transformers for stepping down from 13,200 to 230/115 volts, storage batteries, motor generator sets, testing transformers, potential regulator and switchboard. The main transformers have been purchased from the Packard Electric Company. Full information with regard to the balance of the equipment has not yet been received.

Corporation of Bobcaygeon

Assistance was given the Village in connection with the installation of wiring and switching equipment in the local Municipal station.

Corporation of Welland

The Corporation was assisted in the purchase of a 2,200 volt feeder panel and an automatic potential regulator for their sub-station. Assistance was also given the Standard Steel Construction Company in connection with the design and construction of their sub-station.

Parliament Buildings

The equipment previously referred to as having been purchased by the Provincial Department of Public Works for installation in the Parliament Buildings was completely installed and placed in service.

Development

A design for a 13,200 volt lightning arrester of horn gap and series oil cooled resistance type was developed. One set was manufactured and placed in service in Mimico Distributing Station.

A horn gap, 3 pole disconnecting switch suitable for mounting on a pole structure for use with outdoor type transformer station was also developed. Two of these switches have been manufactured, one is in use at Rockwood Distributing station. They are also to be used for disconnecting transmission lines at junction points.

WOOD POLE TRANSMISSION LINES

During the year about 200 miles of wood pole transmission line has been placed under construction, and about 133 miles completed and put in operation. Of this 200 miles of line, 113 miles are an extension to the Niagara System, 22 miles extension to the St. Lawrence System, and 65 miles from the new generating plant at Wasdell's Falls on the Severn River.

On November 1st, 1913, the Commission had in operation, or under construction, approximately 555 miles of wood pole lines built to transmit power at voltages from 2,200 to 26,400 volts. The 555 miles of line is a total of the mileage on the various systems as follows:—

Niagara System—378 miles.
St. Lawrence System—45 miles.
Simcoe System—67 miles.
Wasdell's Falls System—65 miles.

In the construction of these lines 23,000 poles have been used, and 1,311 tons of copper aluminum and steel wires and cables.

Several special structures were erected during the past year, such as a wood pole structure to carry apparatus for an outdoor type of transformer station at Rockwood, and wood pole structure to carry aerial line switches at Britannia.

The following tables give, in detail, all particulars of wood pole lines erected during the last year, and totals of all wood pole lines to date.

The mileage of the lines tabulated according to the voltage and number of circuits is as follows:—

Voltage	Single Circuit Totals			Double Circuit Totals			Totals. Single and Double Circuits		
	To Oct. 31st, 1912	October 31st, 1912, to Oct. 31st, 1913	To October 31, 1913	To Oct 31st, 1912	October 31st, 1912, to Oct. 31st, 1913	To 31st Oct., 1913	To Oct. 31st, 1912	October 31st, 1912, to Oct. 31st, 1913	To Oct. 31st, 1913
26,400	......	1.25	1.25	......	70.75	70.75	......	72.00	72.00
22,000	4.50	87.79	92.29	......	63.90	63.90	4.50	151.69	156.19
13,200	76.77	78.66	155.43	115.46	....	115.46	192.23	78.66	270.89
6,600	2.42	11.18	13.60	5.79	....	5.79	8.21	11.18	19.39
4,000	......	25.25	25.25	......	....	....	......	25.25	25.25
2,200	5.44	5.68	11.12	.63	....	.63	6.07	5.68	11.75
Totals	89.13	209.81	298.94	121.88	134.65	256.53	211.01	344.46	555.47

Description of Lines.

Niagara System.

Sec. No,	From	To	Miles	No. of Poles	Voltage	No. of Circuits	Power Cables B. & S. Gauge	Telephone Wires, B & S. Gauge	Work Commenced	Work Completed	In Operation
L.T.											
1	Dundas Sub H.E.P.C. ..	Junction Pole No. 134..	2.84	134	13,200	2	No. 0 Alum.	10	July 13, 1910	Jan. 2, 1911	
2	Junction Pole No. 134..	Beach Pump House....	6.34	323	"	2	0 "	10	July 13, "	Jan. 2, "	
3	" " No. 134..	Asylum	1.13	67	"	1	2 "	10	Dec. 5, "	Feb. 8, "	
4	Berlin Sub. H.E.P.C. ...	Junction Pole No. 10...	.18	10	"	2	0 "	10	Aug. 25, "	Sept.11, 1910	
5	Junction Pole No. 10...	Waterloo	1.64	78	"	2	0 "	10	Sept.11, "	Nov. 25, "	
6	" " No. 10...	Berlin Corp. Station...	.76	35	"	2	0 "	10	Aug. 25, "	Sept.11, "	
7	Berlin Sub. H.E.P.C....	New Hamburg	12.27	556	"	2	2 "	10	Sept. 11. "	Jan. 2, 1911	Feb. 3,1911
8	Woodstock " ...	Ingersoll	9.90	455	"	2	0 "	10	Nov. 14, "	Mar. 28, "	
9	" " ...	Junction Pole No. 508..	11.12	508	"	2	0 "	10	Jan. 2, 1911	Apr. 29, "	
10	Junction Pole 508	Tillsonburg	10.30	467	"	2	0 "	10	Jan. 2, "	Apr. 29, "	
11	" " 508	Norwich	4.59	207	"	1	2 "	10	Feb. 13, "	Mar. 30 "	
12	St. Thomas Sub.H.E.P.C	St. Thomas Corp. Stn..	1.13	50	"	2	0 "	10	Dec. 14, 1910	Dec. 30, 1910	
13	Stratford " ..	Stratford " ..	1.75	78	"	1	2 Copper	10	Built by Cor	poration	
14	Preston " ..	Junction Pole No. 99...	2.04	99	6,600	3	{ 1-2Alum { 2-4/0 "	10	Oct. 8, 1910	Jan. 19, 1911	
15	Junction Pole No. 99...	Hespeler	2.08	99	"	1	2 Alum	10	Oct. 8, "	Dec. 30, 1910	
16	" " 99...	Galt..................	3.75	173	"	2	4/0 "	10	Oct. 8, "	Jan. 19, 1911	
17	Preston Sub H.E.P.C...	Preston Corp. Station..	.14	11	"	1	2 Copper	10	Built by Cor	poration.	
		These poles also carry Section L.T. 35 circuits to G. P. H. Railway Sub.									
18	London Sub.	Junction Pole No. 38..	.79	38	13,200	2	{ 1-3/0 Alum { 1-2 "	10	Oct. 26, 1910	Jan. 10, 1911	
19	Junction Pole No. 38...	Asylum London	1.54	70	"	1	2 "	10	Oct. 26, "	Jan. 19. "	
20	" " 38...	Junction Pole No. 93...	1.20	55	"	1	3/0 "	10	Oct. 24, "	Jan. 21, "	
21	London Sub. H.E.P.C...	London Sub. No. 1.....	3.56	178	"	1	3/0 "	10	Oct. 20, "	Jan. 20, "	
22	Junction Pole No. 93...	" " 1....	1.71	96	"	2	{ 1-3/0 " { 1-1/0 "	10	Dec. 23, "	Jan. 20, "	
23	" " 93...	" " 2....	.31	20	"	1	0 "	10	Dec. 23, "	Jan. 20, "	
24	London Sub. No. 1	Dundas Town	3.55	156	"	1	0 "	10	Jan. 1, "	Jan, 7, "	
25	Dundas Sub. H.E.P.C..	Springbank...........	.98	58	2,200	2	{ 1-400 M.c.m. { 1-250 M.c.m.	Alum Copper	Dec. 1, "	Jan. 1, "	
26	Pt. Credit Sub. H.E.P.C.	Port Credit	2.74	129	13,200	2	2 Alum	10	Feb. 24, 1911	July 10, "	
26a	"	Pt. Credit Brick Wks..	.24	14	"	2	2 "	10	Apr. 5, "	July 23 "	
27	" Sub. H.E.P.C.	Brampton	11.24	510	"	2	2 "	10	Feb. 15, "	May 6, "	
		These poles also carry Section L.T. 34 Circuits from poles No. 1 to 89—1.94 miles									
28	Stratford Sub. H.E.P.C.	Junction Pole No. 648..	14.39	648	13,200	2	2 Alum	10	Apr. 6, 1911	Aug. 4, 1911	
		These Circuits carried on Stratford City poles Nos. 2 to 24, inclusive, erected by Corporation.									

29	Junction Pole No. 648..	Seaforth	12.86	581	13,200	2	2 Alum	10	Mar. 25, 1911	Sept.13, 1911	
30	" " 648..	Mitchell	1.27	63	"	2	2 "	10	Mar. 24, "	Aug. 3, "	
31	Guelph Sub. H.E.P.C...	O. A. College	1.58	77	"	1	0 "	10	July 21, "	Nov. 9, "	
32	" H.E.P.C.Sub. Prop.	....	.09	8	550D.C. 2,200A.C. 13,200A.C.	1 4 3	Municipal lines 0 Alum	10	Aug. 7, 1911	Sept. 3, 1911	Sept.4,1911
		18 poles on Station Property in all.									
34	Pt. Credit Sub. H.E.P.C.	Weston	14.07	551	13,200	2	2 Alum	8	Apr. 19, "	July 24, "	
		These Circuits carried on Section L.T. 27 poles, 1 to 89, inclusive									
35	Preston Sub. H.E.P.C..	G. P. & H. Ry.	.20	6	6,600	1	0 Alum	10	Mar. 13, "	Mar. 21, "	
		These Circuits carried on Sections L.T, 17 poles, 1 to 11, inclusive									
36	Jct. Pole No. 34, Port Credit	Mimico (New Toronto)	5.75	276	13.200	1	2 Alum	8	Apr. 26, "	Feb. 29, 1912	
38	Dundas Sub. H.E.P.C...	Dom. Sewer Pipe Wks.	7.35	350	"	1	2 "	8	July 21, "	Dec. 19, 1911	Apr. 6,1912
39	Hamilton Asylum P.H..	Hamilton Asylum	.63	30	2,200	2	4 Copper	10	Sept. 26, "	Oct, 27, "	Apr. 6, "
40	Junction Pole No. 260..	Waterdown	1.50	72	13,200	1	2 Alum	8	Sept. 30, "	Oct. 10, "	Apr. 6, "
40a	Dom. Sewer Pipe Wks.	Junction Pole No. 260..	1.92	....	"	1	2 "	8	Sept. 30, "	Oct. 7, "	Mar. 1, "
41	St. Thos. Sub. H.E.P.C.	Port Stanley	12.27	573	"	1	2 "	8	Oct. 16, "	Mar. 8, 1912	Mar. 9, "
42	Junct. Pole, Sec. L.T. 48 at Beachville	Standard White Lime Co.	1.00	2	2,200	1	2 "	....	....	....	....
42a	Standard White Lime Co.	These circuits carried on Section L.T. 8 poles, from Beachville pole 290 to pole 240.									
		Temporary connection.	......	....	2,200	1	2 Alum	....	Dec. 6, 1911	Dec. 16, 1911	Dec. 21, '11
43	Dundas Sub. H.E.P.C..	Jno. Bertram & Son ...	1.21	10	13,200	1	2 "	....	" 1 "	" 19 "	"
		These Circuits carried on Section L.T. 25 poles, 1 to 58 inclusive.—.98 miles									
45	Jct. Pole No. L.. 8-240	Beachville	.09	3	13,200	1	0 Alum	8	June 1, 1912	June 29, 1912	July 17, '12
46	St. Mary's Sub.	St. Mary's Cement Wks.	2.22	80	"	1	3/0 "	8	July 15, "	Aug. 19, "	Sep. 7, "
47	Dundas Sub.	Caledonia	14.36	674	"	1	3/0 "	8	May 10, "	Sep. 18, "	" 20, "
47a	Caledonia	Paris Alabastine Co...	.22	....	2,200	1	2/0 D.B.W.P. Copper		Sep. 5, "	Sep. 18, "	" 20, "
		These Circuits carried on Section L.T. 49 poles.									
48	Caledonia	Junction Pole No. 940..	5.87	267	13,200	1	3/0 Alum	8	June 22, "	Sep. 18, "	Sep. 20, '12
49	Junction Pole No. 940..	Hagersville	3.79	176	"	1	2 "	10	Feb. 28, 1913	May 2, 1913	Aug. 15, '13
50	" " 940..	Lythmore	4.98	230	"	1	3/0 "	8	June 15, 1912	Sep. 18, 1912	Sep. 20, "
55	St. Thomas Sub. H.E.P.C	L.L.E. Ry. Sub.	1.68	88	"	1	2 "	8	Aug. 9, "	Oct. 11, "	Oct. 27, "
56	Jct. Pole 36-240	Toronto Golf Club	3.24	11	2,200	1	6 D.B.W.P. Copper		June 10, "	Aug. 3, "	Aug. 6, "
56e	Extension from Sect. L.T. 56	Toronto Township	0.9	37	2,200	1	6 "	....	Nov. 22, "	Jan. 3, 1913	Dec. 24, "
57	O. A. College	Guelph Prison Farm, Pole 156	1,93	86	13,200	1	2 Alum	8	Aug. 19, "	Dec. 14, 1912	Dec. 14, "
57a	Guelph Prison Farm ..	Property	.08	4	"	1	2 "	10	May 14, 1913	May 19, 1913	Sep. 4 '13
58	Guelph Prison Farm, Pole 156	Junction Pole No. 454..	6.42	297	"	1	2 "	8	Aug. 19, 1912	Dec. 14, 1912	Dec. 14, '12
59	Junction Pole No. 454..	Acton	5.82	268	"	1	2 "	8	" 19, 1912	Dec. 14, 1912	Dec. 14, "
60	St. Catharines	Port Dalhousie	3.18	142	2,200	1	1/0 "	....	Oct. 16, 1912	Nov. 21, "	Nov. 17, "
61	Caledonia Sub.	Caledonia	.30	....	"	1	4 D.B.W.P. Copper		Nov, 20, 1912	Nov. 30, "	Nov. 30, "
		Carried on Section L.T. 50 poles.									

Niagara System.—Continued.

Sec. No.	From	To	Miles	No. of Poles	Voltage	No. of Cir-cuits	Power Cable B.& S. Gauge	Telephone Wires, B. & S. Gauge	Work Commenced	Work Completed	In Operation
L.T.											
62	Jct. Pole L.T. 27-230 ..	Milton	16.65	740	13,200	1	3/0 Alum	10	Nov. 25, 1912	Mar. 13, 1913	Mar. 13,'13
63	Preston Sub.	Doon Twine Mill	4.18	208	6,600	1	2 "	....	Dec. 2, 1912	Apl. 11, "	Apl. 1, "
		Carried on Section L.T. 17 poles, No. 1 to 17, inclusive.									
64	Mimico Sub.	Mimico Asylum	1.51	17	2,200	1	2 Copper	....	Mar. 30, 1912	Feb. 3, "	Apl. 26, "
		Carried on Section L.T., 36 poles									
65	Acton	Georgetown	9.03	411	13,200	1	3/0 Alum	10	Mar. 11, 1913	Aug. 1, "	Aug. 1, "
66	Junction Pole No. 454..	Rockwood	1.64	77	"	1	2 "	10 CC.Steel	May 6, 1913	July 3, "	Aug. 1, "
67	Stratford Sub. H.E.P.C.	Goderich	48.00	1,150	26,400	2	3/0 "	"	....	....	....
		Carried on Section L.T. 28 and L.T. 29 poles, to Seaforth Junction from Stratford.									
68	Brant Station	Paris	3.50	175	26,400	2	3/0 Alum	10 CC.Steel	....		
69	" "	Brantford	6.50	325	26,400	2	3/0 "	"	....		
71	Waterloo	Elmira	12.00	600	13,200	1	2 "	"	....		
72	Preston	Breslau...............	7.00	350	6,600	1	2 "	"	....		
74	Niagara Falls	Welland	14.75	....	26,400	4	3/0 "	Steel poles	....	Under Construction.	
76	Junction Pole	Crumlin Junction	5.50	243	13,200	1	2 "	....	....		
77	Crumlin Junction......	Thorndale	7.50	331	"	1	2 "	....	....		
78	" "	Thamesford	6.75	298	"	1	2 "	....	....		
79	Junction Pole No. 381-62.	Streetsville...........	.43	22	"	1	2 "	10 CC.Steel	....		
80	" "	Clinton	1.25	63	26,400	1	3/0 "	"	....		

Severn System

Sec. No.	From	To	Miles	No. of Poles	Voltage	No. of Cir-cuits	Power Cable B.& S. Gauge	Telephone Wires, B. & S. Gauge	Work Commenced	Work Completed	In Operation
S.L.											
1	Waubaushene (S.R. & P. Co.)	Jct. Pole (Coldwater)..	4.29	193	22,000	2	4/0 Alum	10 CC.Steel	Sep. 20, 1912	Feb. 18, 1913	Feb. 24,'13
2	Jct. Pole (Coldwater)..	Coldwater Sub.	1.16	55	"	1	2 "	"	Sep. 20, 1912	Feb. 18, ,,	"
3	" " " ..	Jct. Pole (Elmvale) ..	15.86	710	"	2	4/0 "	"	Sep. 25, 1912	Feb. 18, ,,	"
4	" " (Elmvale) ..	Elmvale Sub.	.42	19	"	1	2 "	"	Feb. 1, 1913	May 17, ,,	May 27, "
5	" " " ..	Jct. Pole (Phelpston)..	4.55	207	"	2	4/0 "	"	Oct. 20. 1912	Feb. 18, "	Feb. 24, "
6	" " (Phelpston) .	Barrie Sub.	12.27	550	"	2	2/0 "	"	Nov. 6, 1912	Apl. 5, "	April 6, "
7	" " " ..	Jct. Pole (Stayner) ...	15.07	675	"	2	3/0 "	"	Oct. 23, 1912	Feb. 18, "	Feb. 24, "
8	" " (Stayner) ...	Stayner Sub.	1.50	68	"	1	2 "	"	Jan. 24, 1913	Apl. 26, "	Sep. 25, "
9	" " " ...	Collingwood Sub.	11.86	530	"	2	3/0 "	"	Nov. 1, 1912	Feb. 18, "	Feb. 24, "
L.T.											
37	Midland (S.R. & P. Co.)	Penetang Sub.	4.50	223	"	1	2 "	10 CC.Steel	June 7, 1911	July 18, 1911	July 18,'11

St Lawrence System.

Sec. No.	From	To	Miles	No. of Poles	Voltage	No. of Cir-cuits	Power Cable B.& S. Gauge	Telephone Wires, B. & S. Gauge	Work Commenced	Work Completed	In Operation
.L.											
1	Morrisburg	Prescott...............	22.96	1,083	22,000	1	3/0 Alum	10 CC.Steel	Oct. 29, 1912	June 14, 1912	Oct. 1913
2	"	Winchester............	16.00	800	"	1	3/0 "	"	(Under con	struction)	....
3	Winchester	Chesterville	6.25	330	"	1		"	"	"	....

Wasdell's Falls System

W. L.											
1	Wasdell's Falls..........	Jot. No. 1..............	27.25	1,363	22,000	1	No. 0 al....	10 CC.Steel	....	....	....
2	Jct. No. 1	Beaverton.,.............	1.75	88	22,000	1	No. 0 al....	10 CC.Steel	....	....	....
3	Jct. No. 1	Cannington.............	10.50	525	22,000	1	No. 0 al....	10 CC.Steel	....	....	....
4	Beaverton	Gamebridge............	6.50	....	4,000	1	No. 0 al....	....	....	....	....
5	Gamebridge	Brechin................	3.75	....	4,000	1	No. 0 al....	....	....	....	....
5	Cannington.............	Woodville..............	7.25	264	4,000	1	No. 0 al....	....	....	....	....
7	Cannington.............	Sunderland............	7.75	387	4.000	1	No. 0 al....	....	....	....	....
			64.75	2,627							

Gauge, Length and Weight of Conductors

Browne and Sharpe Gauge.	Wire Miles.			Weight Pounds.			Single Miles Circuit.			Miles Double Circuit.		
	To Oct. 31, 1912.	Oct. 31, 1912, to Oct. 31, 1913.	To Oct. 31, 1913,	To Oct. 31, 1912.	Oct. 31, 1912, to Oct. 31, 1913.	To Oct. 31, 1913.	To Oct. 31, 1912.	Oct. 31, 1912, to Oct. 31, 1913.	To Oct. 31, 1913.	To Oct. 31. 1912.	To Oct. 31, 1913.	Oct. 31, 1913.
400 M.C.M. Alum	1.67	....	1.67	3,205	....	3,205	.53	....	.53	....	....	....
4/0 Alum....................	36.48	206.01	242.49	37,283	210,542	247,825	....	16.00	16.00	5.79	24.70	30.49
3/0 "	109.27	699.30	808.57	88,618	567,132	655,750	34.69	56.14	90.83	....	82.93	82.93
2/0 "	....	77.30	77.30	....	47,704	47,704	....	....	....	....	12.27	12.27
1/0 "	300.16	206.16	506.32	153,082	110,515	263,597	7.53	68.53	76.06	43.88	....	43.88
2 "	578.15	211.81	789.96	185,586	67,991	253,577	45.83	67.24	112.62	69.08	....	69.08
250 M.C.M. D.B.W.P. Copper..	1.42	....	1.42	2,043	....	2,043	.45	....	.45	....	....	....
No. 4/0 Bare Copper Cable....	....	139.39	139.39	....	459,151	459,151	....	14.75	14.75	....	14.75	14.75
2/0 D.B.W.P. Copper	.69	....	.69	1,587	....	1,587	.22	....	.22	....	....	....
No. 2 Bare Copper	13.29	4.75	18.04	17,131	6,123	23,254	4.22	1.51	5.73	....	....	....
No. 4 D.B.W.P. Copper.......	3.97	.94	4.91	3,057	724	3,781	....	.30	.30	.63	....	.63
No. 6 D.B.W.P. Copper.......	10.21	.28	10.49	5,176	142	5,318	3.24	.09	3.33	....	....	....
Totals..................	1,055.31	1,545.94	2,601.25	496,768	1,470,024	1,966,792	96.26	224.56	320.82	119.38	134.65	254.03

Gauge, Length and Weight of Copper Clad Steel Wire

USED ON LOW TENSION TELEPHONE LINES

Brown and Sharpe Gauge.	Wire Miles.			Weight in Pounds.			Mileage Single Circuit.		
	To Oct. 31st, 1912.	Oct. 31st, 1912, to Oct. 31st, 1913.	Totals to Oct. 31st, 1913.	To Oct. 31st, 1912.	Oct. 31st, 1912, to Oct. 31st, 1913.	Totals to Oct. 31st, 1913.	Totals to Oct. 31st, 1912.	Oct. 31st, 1912, to Oct. 31st, 1913.	Totals to Oct. 31st, 1913.
No. 10	283.33	540.75	824.08	43,689	73,715	117,404	134.92	259.88	394.30
No. 8	147.34	63.46	210.80	36,098	15,548	51,646	70.16	30.22	100.38
Totals	430.67	604.21	1,034.88	79,787	89,263	169,050	205.08	289.60	494.68

Total Mileage of Lines

—	Totals to Oct. 31st, 1912.	Year Oct. 31st. 1912, to Oct 31st, 1913.	Totals to Oct. 31st, 1913.
Total mileage low tension lines	344.58	210.89	555.47
Total mileage single circuit lines	225.35	91.41	316.76
Total mileage double circuit lines	119.23	119.48	238.71
Total mileage low tension telephone lines	325.48	166.52	494.68
Total mileage lines completed	236.68	120.79	357.47
Total mileage under construction	107.90	....	198.00
Total number of poles	15,478	7,825	23,303

Total Weights and Mileages of Cable and Wire

Cable or Wire	Wire Miles.			Weight in Pounds.		
	To Oct. 31st, 1912.	Oct, 31st, 1912, to Oct. 31st, 1913.	To Oct. 31st, 1913.	To Oct. 31st, 1912.	Oct. 31st, 1912, to Oct. 31st, 1913.	To Oct. 31st, 1913.
Aluminum Cable	1,025.73	1,400.48	2,426.21	467,774	1,003,884	1,471,658
Copper Cable	2.11	139.39	141.50	3,630	459,151	462,781
Copper Wire	27.47	5.97	33.44	25,364	6,989	32,353
Copper Clad Steel Wire	430.67	604.21	1,034.88	79,787	99,263	179,050
¼ in. Steel Cable	215.19	340.23	555.42	181,835	276,395	458,230
Totals	1,701.17	2,490.28	4,191.45	758,390	1,845,682	2,604,072

CHAPTER III

OPERATION OF THE SYSTEMS

NIAGARA SYSTEM

The general operation of the Niagara System for the past fiscal year has been very satisfactory. The power supply furnished to the Commission by the Ontario Power Co. has been practically continuous throughout the year. The majority of interruptions experienced on the Commission's Niagara System last year were due to the failure of the high tension insulators on the Commission's lower lines, and extended over a period from June 12th to Aug. 22nd, during which time all the insulators on the system were inspected and the defective units replaced, thus eliminating the trouble from this cause.

During the year thirty-five different electrical storms were reported over the System, of which twelve were severe and the balance moderate. The first storm occurred on February 22nd and the last on October 2nd. There were ten of these storms which travelled over the entire System, while twenty were confined to the Western loop and five to the vicinity of Cooksville high tension station.

Experience from preceding years, as well as the past summer, seems to point out that Woodstock, St. Mary's and Cooksville are the vicinities where electrical storms are more prevalent and severe than on other parts of the Commission's Niagara System.

The high tension transmission line is in good condition at the present time, and the cable itself required little or no attention during the past year.

Due to the rapid growth of the System it was found necessary to take down the No. 3/0 aluminium cable circuit on a section of the high tension transmission line between London and St. Thomas and to string two circuits of No. 3/0 copper equivalent steel re-inforced aluminum cable. This work has been completed by the Line Maintenance Department and work will be started at once on the double circuiting of the southern half of the western loop, which extends between Dundas and London stations, with No. 4/0 copper equivalent steel re-inforced aluminum cable. This double circuit of No. 4/0 equivalent will replace the present single circuit of No. 3/0 aluminum cable.

When this work is complete there will be three separate circuits between Dundas and London. This will tend to greatly increase the flexibility of the System and the reliability of the service.

The adoption of the steel reinforced aluminum cable in preference to the straight aluminum cable heretofore used was decided upon after careful investigations.

The low tension lines on the Niagara System have given satisfactory operation and at the present time arrangements are being made for the installation of sectionalizing and tap switches on these lines, which will add considerably to the efficiency of operation and maintenance of power supply.

The following low tension lines were gone over during the year and straightened and the sags readjusted where necessary:—

Waterloo, New Hamburg and Baden, Stratford, Port Stanley, Tillsonburg and Norwich, Ingersoll and Beachville, and Waterdown.

All the low tension lines on the System are being patrolled at least once a week. All the private telephone equipment and lines are in first class condition and required very little line maintenance work, except tree trimming in some localities, during the past year.

The electrical and mechanical equipment of the high tension stations is also in first class condition and operating very satisfactorily. Both the high tension and the low tension electrolytic lightening arresters in all the stations have been thoroughly overhauled and cleaned, and new electrolyte added by the Station Maintenance Department in the past year. This was done in order to keep the arresters in perfect condition so that they would be able to dissipate with ease the abnormal charges which sometimes accumulate on the transmission lines.

At the Preston and Berlin stations an emergency bus bar has been installed, and by means of this a single operator, without help, can, in case of a breakdown to a transformer, disconnect the bad transformer and connect the spare transformer in a very few minutes. This detail will add considerably to the reliability of the power supply.

The outside appearance of the stations has been further improved during the year. Most of this work has been done by the operators themselves and consisted of painting, gardening, etc., all of which had added to the appearance of the station and grounds.

A glance through the various increases will show the gratifying growth of the Niagara System.

The following municipalities were supplied with power during the fiscal year; the table as given below, as well as the accompanying curves, shows the increases in the power loads:—

Municipality	Load in h.p. Oct. 1912	Load in h.p. Oct. 1913	Increase in h.p.
Toronto	13036.5	17997.5	4961
London	2681	3385	704
Guelph	1273.5	1488	214.5
Stratford	643.5	791	147.5
Mitchell	221	201	....
St. Thomas	643.5	1173	529.5
Woodstock	837.5	808.5	....
Ingersoll	496	469	....
Tillsonburg	194.5	208	13.5
Berlin	1226.5	1434.5	208
Waterloo	402	409	7
New Hamburg	107	153	46
Preston	643.5	931.5	288.5
Galt	643.5	1025.5	382
Hespeler	107	254.5	147.5
St. Mary's	261	368.5	107.5
Dundas	127.5	268	140.5
Hamilton	2044	3639.5	1595.5
Hamilton Asylum	87	80.5	....
Weston	100.5	151.5	51
Brampton	382	474.5	92.5
Norwich	67	104.5	37.5
Seaforth	174	214.5	40.5
Waterdown	40	41.5	1.5
Ontario Agriculture College	114	129	15
London Asylum	67	120	53
Pt. Stanley	40	73	33
Baden	13.5	165	151.5
Mimico	50	71	21
Beachville	27	100.5	73.5
Pt. Credit	24	33.5	9.5
Caledonia	13.5	32	18.5

A list of the municipalities connected to the Niagara System during the past year is given below:—

Municipality	Date Connected	Initial Load in h.p.	Present Load in h.p.	Increase in h.p.
Hagersville	Aug. 15th, 1913	108.5	120.5	12
Central Prison Farm	Sept. 3rd, 1913	36.5	31	......
Rockwood	July 31st, 1913	25	25	......
Georgetown	July 31st, 1913	76	83	7
Acton	Dec. 11th, 1912	53.5	56	2.5
Cooksville	Aug. 4th, 1913	......	......	......
Milton	Mar. 13th, 1913	187.5	321.5	134
Mimico Asylum	April 26th, 1913	100	161	61
Toronto Twp	Aug. 2nd, 1913	56.5	80.5	24
Elmira	Oct. 25th, 1913	......	......	......
Streetsville	Oct. 11th, 1913	......	......	......

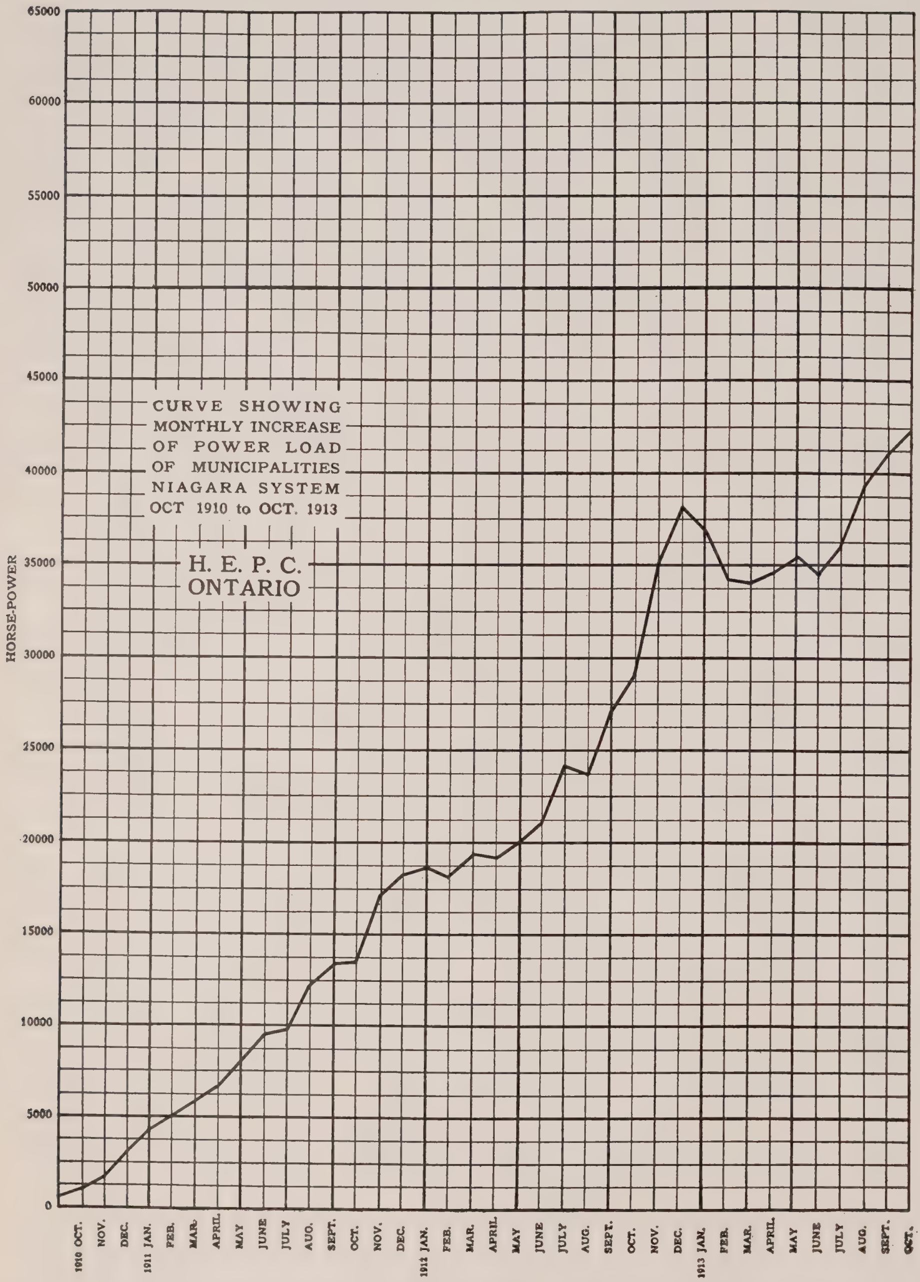
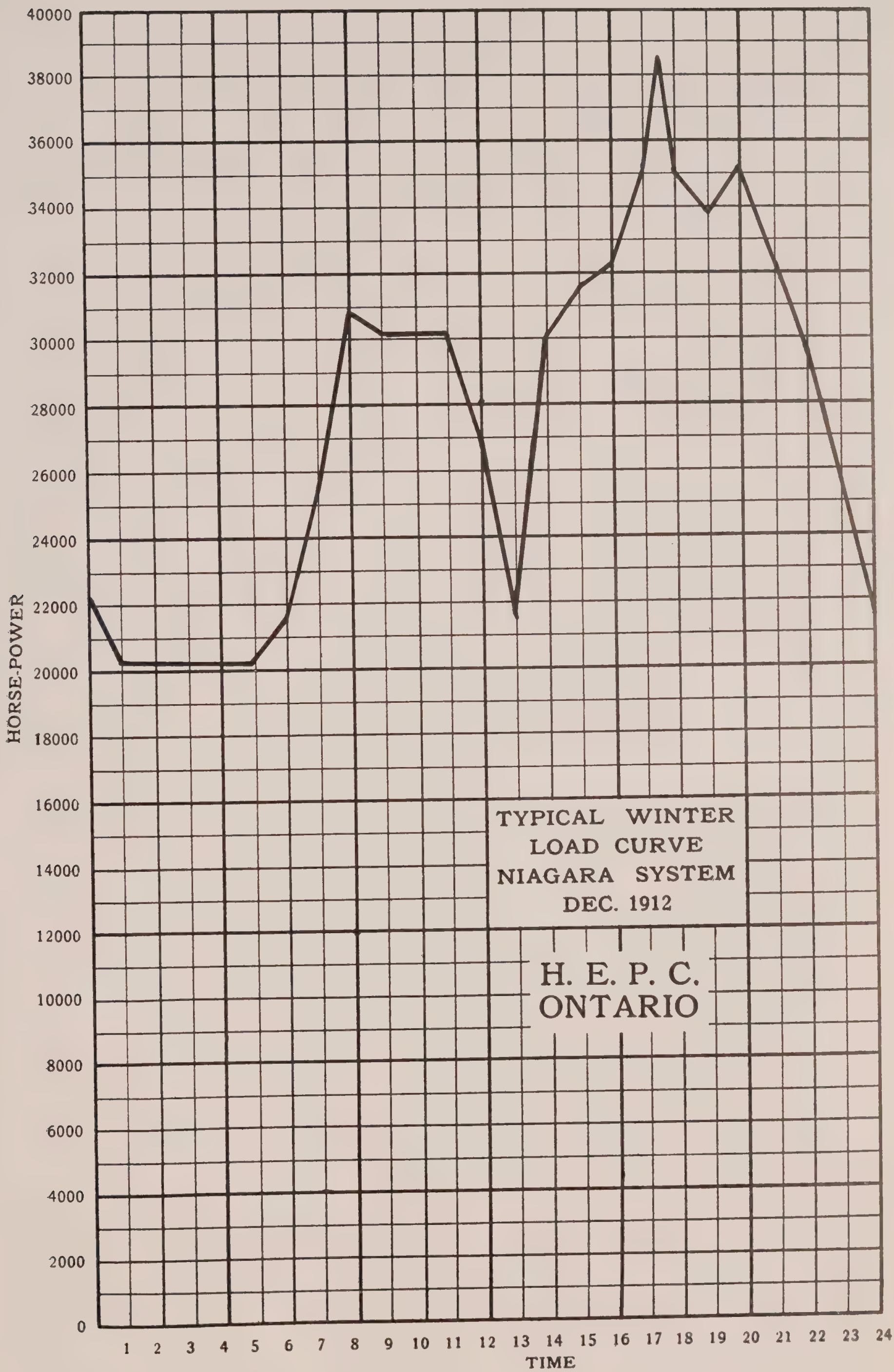
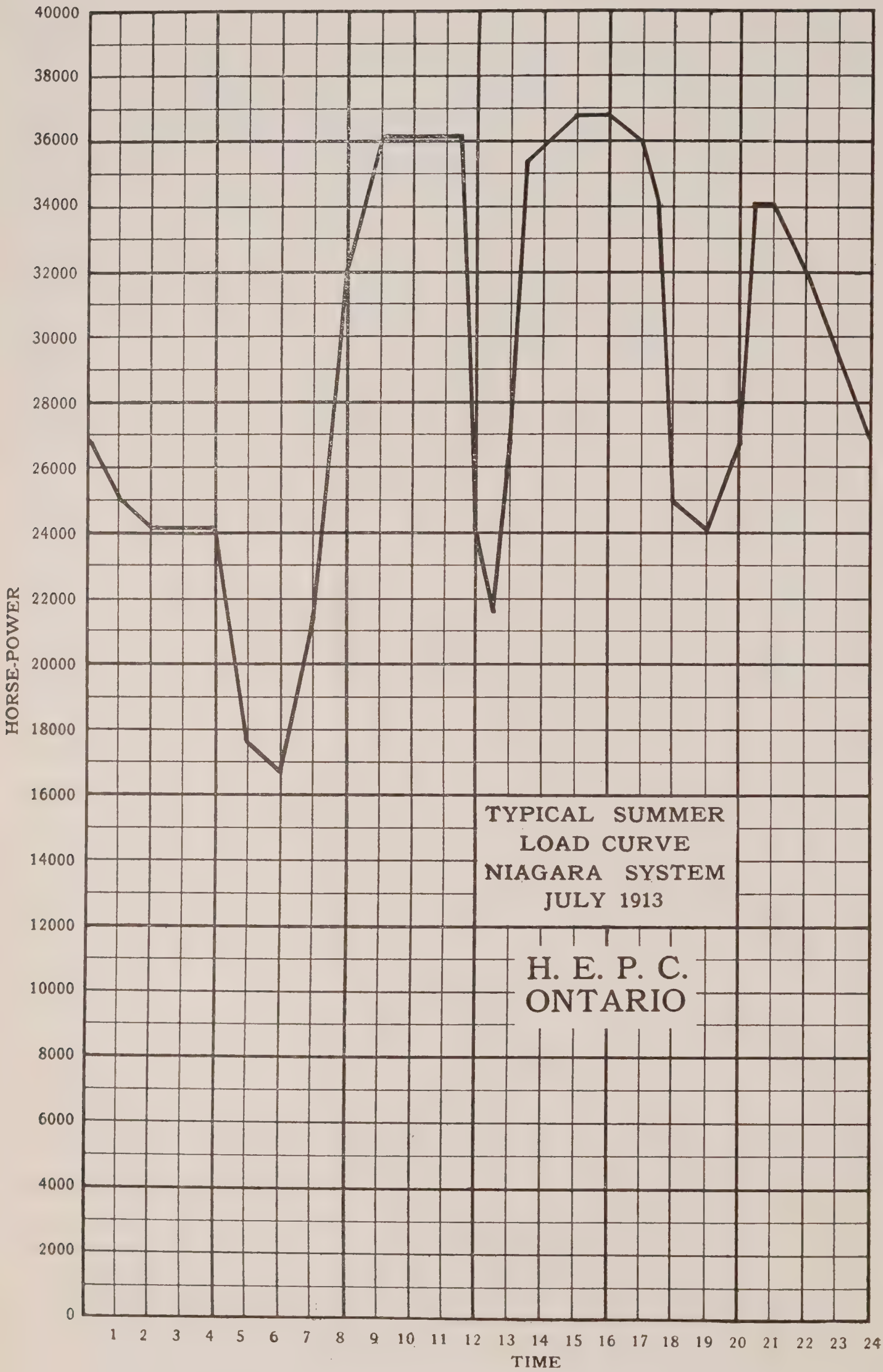
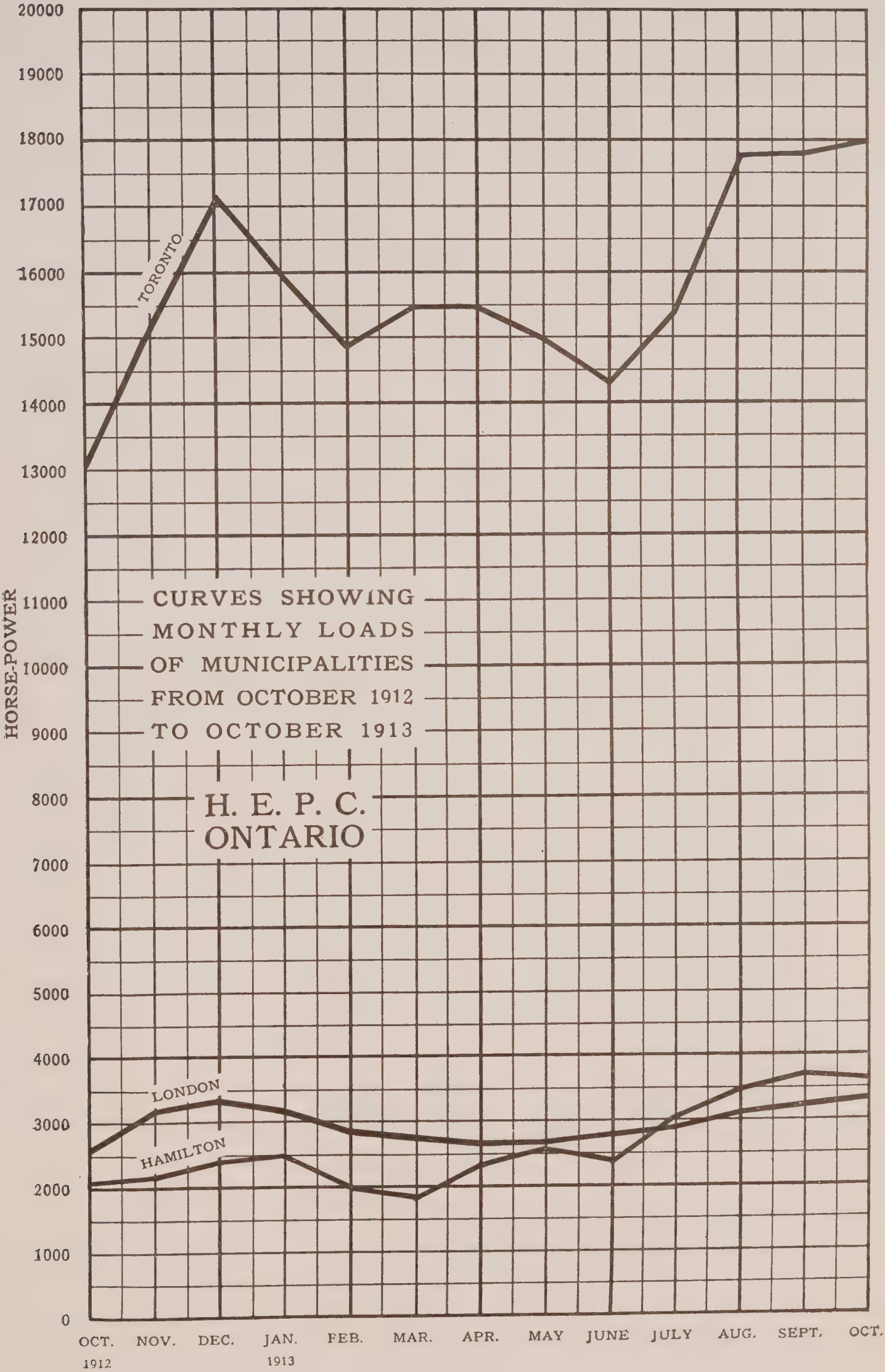


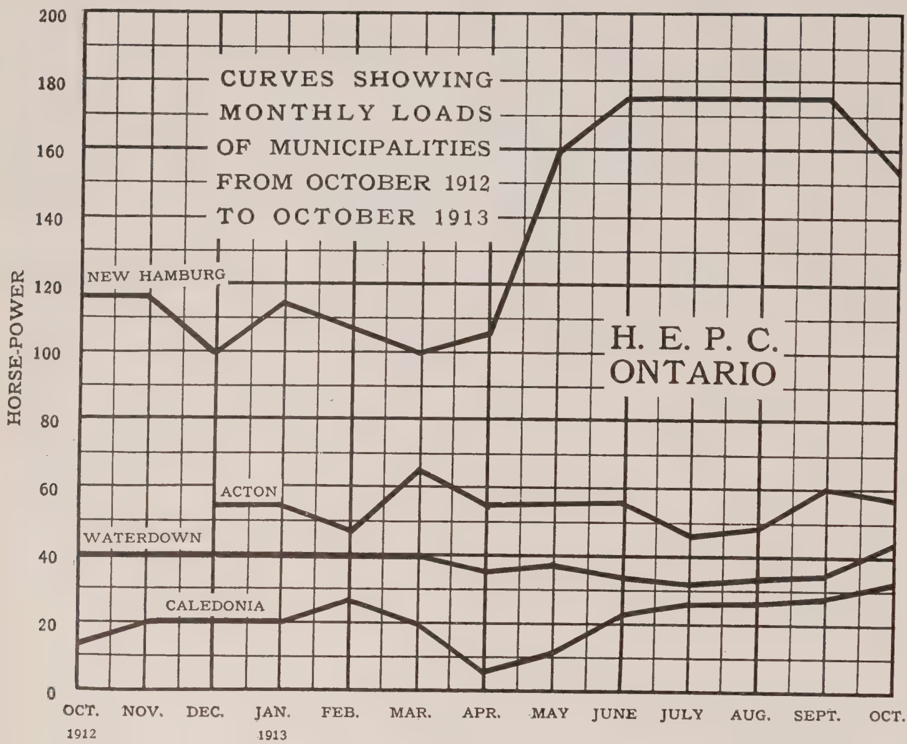
Chart Showing Power Consumption of Municipalities

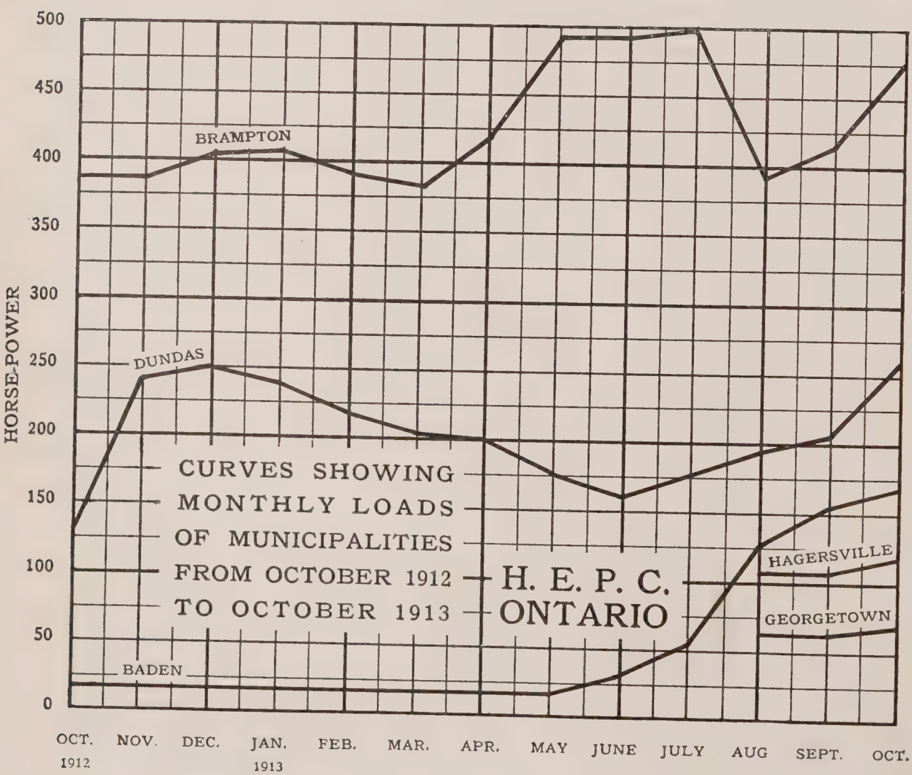

40000
38000
36000
34000
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
HORSE-POWER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME
TYPICAL WINTER
LOAD CURVE
NIAGARA SYSTEM
DEC. 1912
H. E. P. C.
ONTARIO

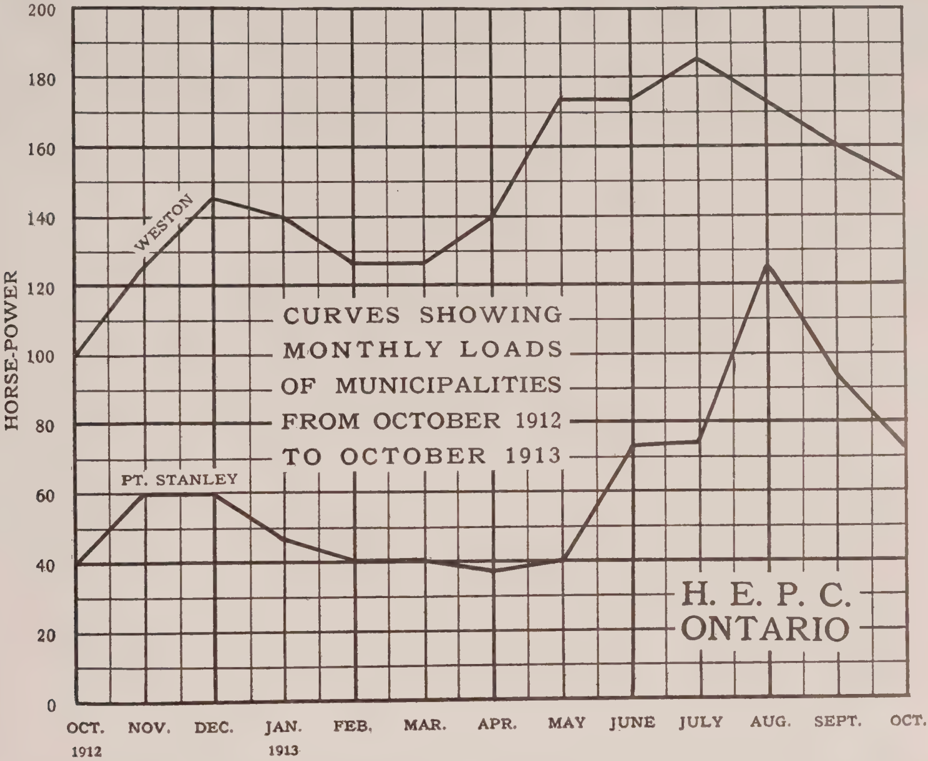

40000
38000
36000
34000
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
HORSE-POWER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME
TYPICAL SUMMER
LOAD CURVE
NIAGARA SYSTEM
JULY 1913
H. E. P. C.
ONTARIO



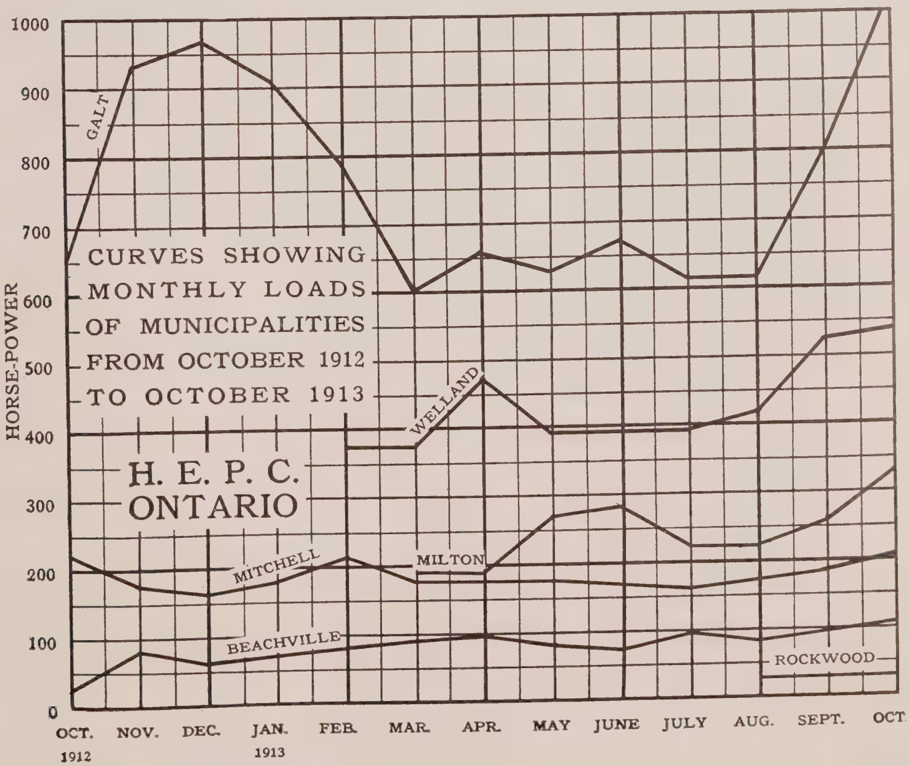
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
HORSE-POWER
TORONTO
LONDON
HAMILTON
CURVES SHOWING
MONTHLY LOADS
OF MUNICIPALITIES
FROM OCTOBER 1912
TO OCTOBER 1913
H. E. P. C.
ONTARIO
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.


CURVES SHOWING
MONTHLY LOADS
OF MUNICIPALITIES
FROM OCTOBER 1912
TO OCTOBER 1913
H. E. P. C.
ONTARIO
NEW HAMBURG
ACTON
WATERDOWN
CALEDONIA
HORSE-POWER
200
180
160
140
120
100
80
60
40
20
0
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.

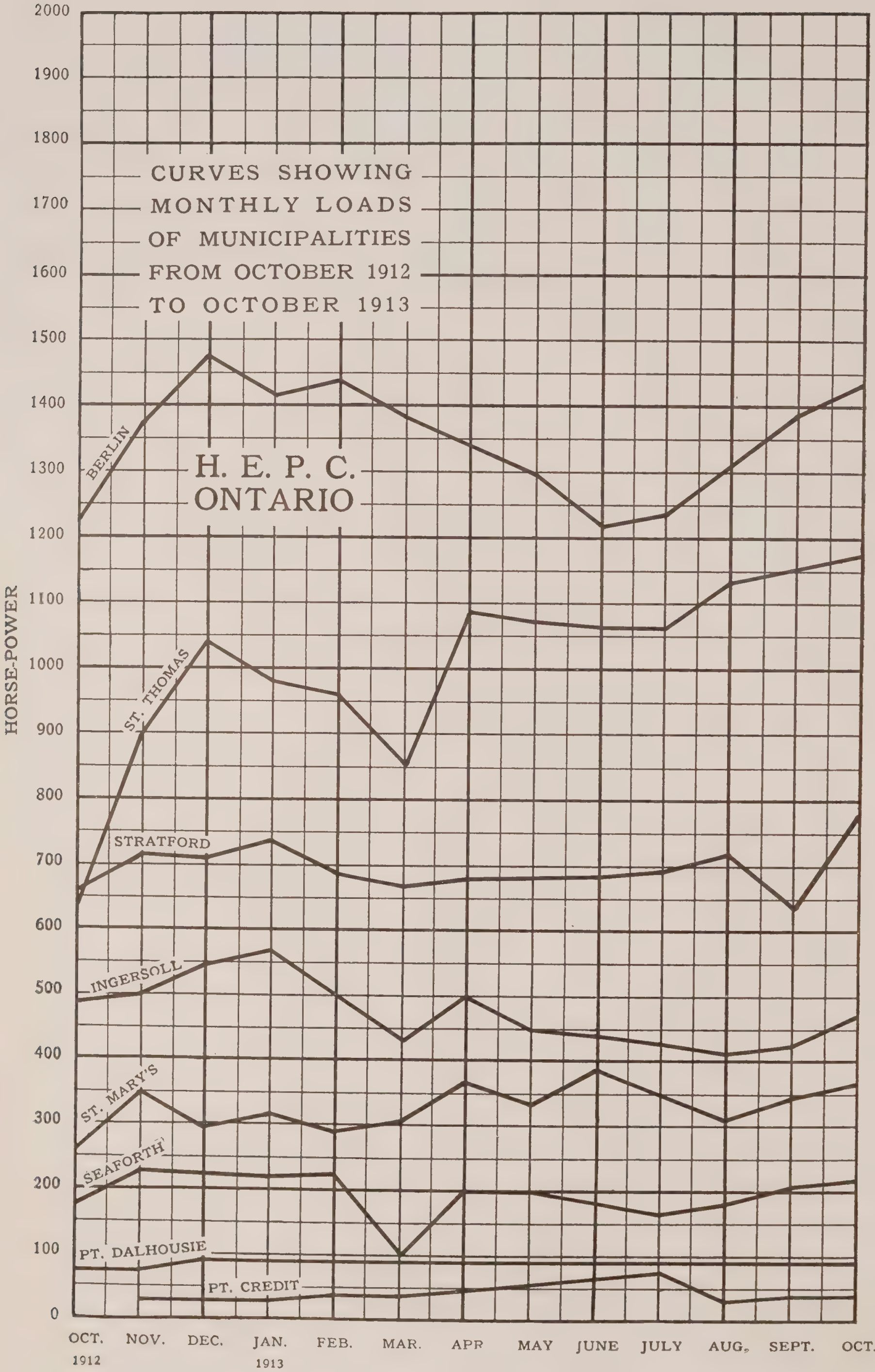

CURVES SHOWING
MONTHLY LOADS
OF MUNICIPALITIES
FROM OCTOBER 1912
TO OCTOBER 1913
H. E. P. C.
ONTARIO
BRAMPTON
DUNDAS
HAGERSVILLE
GEORGETOWN
BADEN
HORSE-POWER
500
450
400
350
300
250
200
150
100
50
0
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG
SEPT.
OCT.

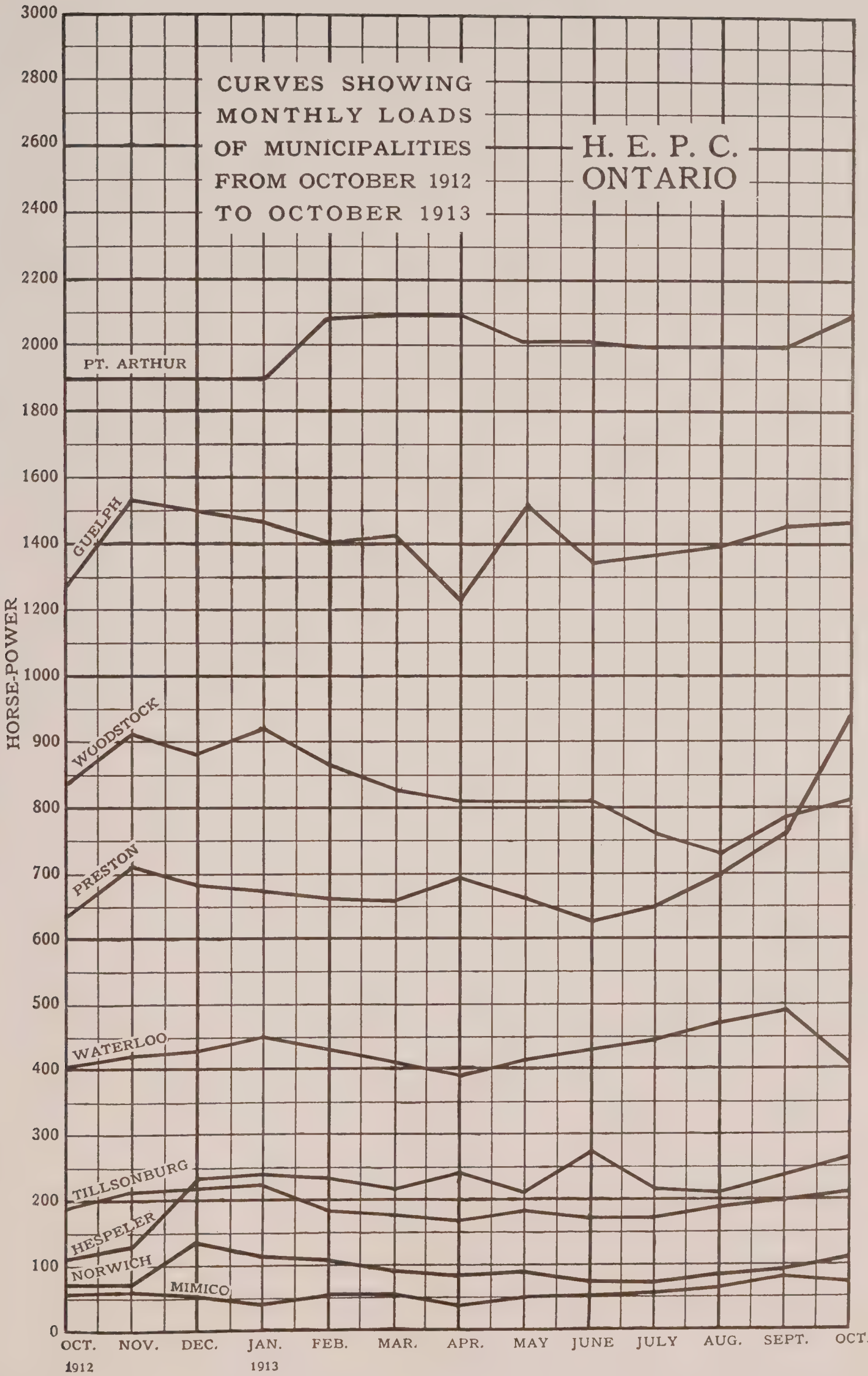


HORSE-POWER
200
180
160
140
120
100
80
60
40
20
0
WESTON
PT. STANLEY
CURVES SHOWING MONTHLY LOADS OF MUNICIPALITIES FROM OCTOBER 1912 TO OCTOBER 1913
H. E. P. C. ONTARIO
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.



HORSE-POWER
1000
900
800
700
600
500
400
300
200
100
0
GALT
CURVES SHOWING MONTHLY LOADS OF MUNICIPALITIES FROM OCTOBER 1912 TO OCTOBER 1913
H. E. P. C. ONTARIO
WELLAND
MITCHELL
MILTON
BEACHVILLE
ROCKWOOD
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.


CURVES SHOWING
MONTHLY LOADS
OF MUNICIPALITIES
FROM OCTOBER 1912
TO OCTOBER 1913
H. E. P. C.
ONTARIO
HORSE-POWER
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
BERLIN
ST. THOMAS
STRATFORD
INGERSOLL
ST. MARY'S
SEAFORTH
PT. DALHOUSIE
PT. CREDIT
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR
MAY
JUNE
JULY
AUG.
SEPT.
OCT.


CURVES SHOWING
MONTHLY LOADS
OF MUNICIPALITIES
FROM OCTOBER 1912
TO OCTOBER 1913
H. E. P. C.
ONTARIO
HORSE-POWER
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
900
800
700
600
500
400
300
200
100
0
PT. ARTHUR
GUELPH
WOODSTOCK
PRESTON
WATERLOO
TILLSONBURG
HESPELER
NORWICH
MIMICO
OCT.
1912
NOV.
DEC.
JAN.
1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.

The total capital investment for the Niagara system to October 31st, 1913, is as follows:—

Right-of-Way, including Windsor Extension	$605,923 24
Steel Tower Transmission Lines, including Windsor Extension	1,895,478 09
Telephone Line	129,681 69
Relay System Lines	54,537 32
Conduit System, Ontario Power Co., to Niagara Station	47,924 92
Wood Pole Lines	775,980 81
Transformer Stations	1,571,784 04
Distributing Stations	73,666 16
Rural Line Construction	35,882 71
Total	$5,190,858 98

The operating and maintenance expenses of the Niagara System for the fiscal year ending October 31st, 1913, are as follows:—

Operators' salaries and expenses, including operating supplies	$42,192 85
Maintenance of H. T. Stations	19,659 83
Maintenance of L. T. Stations	740 40
Maintenance of H. T. Transmission Lines	10,730 41
Maintenance of L. T. Transmission Lines	10,707 13
Administration and general office expenses	25,963 61
Total	$109,994 23

A financial statement of Niagara System operation for the fiscal year ending October 31st, 1913, is given below:

Disbursements			Receipts			
Power purchased, including losses in transmission and transformation administration, general expenses, operation, maintenance and interest			Power delivered, including charges for administration, general expenses, operation, maintenance and interest			
					Surplus	
——	H.P.	Amount	H.P.	Amount	H.P.	Amount
1st quarter	109,182	150,810 96	109,692.5	$187,260 60	510.5	$36,449 64
2nd quarter	98,100	144,874 03	103,107.1	176,311 75	5,007.1	31,437 72
3rd quarter	105,949	150,208 32	105,511.9	180,867 97	—437.1	30,659 65
4th quarter	122,520	171,358 94	122,411.5	206,751 34	—108.5	35,392 40
	435,751	617,252 25	440,723	751,191 66	4,972	133,939 41

	H.P.	Amount.
Sum of monthly load and revenue	440,723	751,191.66
Sum of monthly load purchased and costs	435,751	617,252.25
Net proceeds	4,972	133,939.41

SECOND ANNUAL ADJUSTMENT OF CAPITAL EXPENDITURES, OPERATING EXPENSES AND FIXED CHARGES.
Niagara System. Fiscal year 1912–1913

	Rate	Yearly average H.P.	Capital Cost	Interest	Maintenance	Operation	Total Interest Maintenance and Operation	Cost of Power including losses	Total expenses including losses in transmission and transformation; administration & cost of power: General expenses, operation, maintenance and interest	Receipts	Surplus Applicable to Depreciation Reserve Ac.	Shortage on Interest Account	Surplus Applicable to Depreciation Reserve Ac.
	$		$	$	$	$	$	$	$	$	$	$	$
Toronto	15.00	16065	1,150,539.79	44,378.13	7,137.98	14,783.42	66,299.53	141,352.37	207,651.90	240,975.65	33,323.75	....	....
Port Credit	31.00	63.4	15,125.10	524.61	273.05	151.11	948.77	558.40	1,507.17	1,811.39	304.22	....	....
Weston	30.00	255.9	62,532.60	2,459.70	1,824.37	695.97	4,980.04	2,251.22	7,231 26	7,643.19	411 93	....	....
Brampton	25.00	720.7	106,074.18	4,068.83	3,083.11	1,608.77	8,760.71	6,341.15	15,101.86	18,191.74	3,089.88	....	....
Milton	28.00	420.8	88,573.24	3,112.39	1,607.53	987,96	5,707.88	3,702.44	9,410.32	8,321.10	....	1,089.22	....
Mimico	30.00	224.1	49,421.62	1,897.70	1,340.32	504.73	3,742.75	1,971.84	5,714.59	3,194.52	....	2,520.07	* ....
Dundas	16.00	281.5	23,170.78	821.51	347.86	516.31	1,685.68	2,476.97	4,162.65	5,112.34	949.69	....	* ....
Hamilton	16.00	3652.2	313,689.97	11,177,05	5,968.22	5,430.32	22,575.59	32,134.74	54,710.33	66,939.10	12,228.77	....	....
Waterdown	26.00	48.3	11,080.34	423.42	139.87	114.38	677 67	425.10	1,102.77	1,240.28	137.51	....	....
Caledonia	29.10	28.9	4,079.35	144.61	47.27	42.87	234.75	254.15	488.90	809.14	320.24	....	....
Hagersville	33.21	152.4	37.148.37	924.26	270.07	226.19	1,420.52	1,341.00	2,761.52	1,569.87	....	1,191.65	* ....
Guelph	22.00	1580.4	189,687.94	7,475.15	2,166.76	3,510.21	13,152.12	13,906.46	27,058.58	34,825.19	7,766.61	....	....
Acton	36.00	59.4	21,971.26	744.43	273.10	169.73	1,187.26	522.80	1,710.06	1,741.22	31.16	....	....
Rockwood	38.00	27.5	11,438.32	262.17	87.23	80.61	430.01	242.03	672.04	214.44	....	457.60	* ....
Georgetown	36.00	87.6	53,491.29	1,156.37	363.70	229.86	1,749.93	769.68	2,519.61	655.44	....	1,864.17	* ....
Preston	21.50	1036.7	126,037.99	4,792.70	1,330.55	1,593.97	7,717.22	9,121.03	16,838.25	24,503.90	7,665.65	....	....
Galt	22.00	1129.4	149,739.92	5,913,55	1,618,71	1,740.66	9,272.92	9,938.07	19,210.99	27,299.17	8,088.18	....	....
Hespeler	23.00	317.3	42,501.86	1,678.78	534.32	515.65	2,728.75	2,791.79	5,520.54	7,604.67	2,084.13	....	....
Berlin	22.50	1357.2	186,372.86	7,358.94	1,903.28	2,670.05	11,932.27	11,941.70	23,873.97	30,538.14	6,664.17	....	....
Waterloo	23.50	427.3	63,662.05	2,515.96	674.59	818.76	4,009.31	3,759.72	7,769.03	10,042.35	2,273.32	....	....
New Hamburg	32.00	137.7	43,428.62	1,696.84	1,483.19	311.30	3,491.33	1,211.59	4,702.92	4,890.67	187.75	....	....
Baden	37.00	53.9	18,066.53	639,55	407.86	125.32	1,172.73	474.25	1,646.98	2,001,71	354.73	....	....
Stratford	30.00	697.7	149,221.13	5,919.06	1,637.11	2,318.28	9,874.45	6,138.90	16,013.35	20,930.00	4,916.65	....	....
Seaforth	40.00	194.9	83,699.43	3,303.34	949.04	667.85	4,920.23	1,714.88	6,635.11	8,022.54	1,387.43	....	....
Mitchell	37.00	180.9	57,470.08	2,266.18	861.87	609.69	3,737.74	1,591.70	5,329.44	6,692.37	1,362.93	....	....
St. Mary's	29.50	1640.5	377,197.95	14,949.34	3,533.05	3,927.54	22,409.93	14,434.39	36,844.32	49,755.56	12,911.24	....	....
Woodstock	23.00	823.3	119,520.85	4,717.97	1,112.33	1,847.71	7,678.01	7,244.03	14,922.04	19,059.06	4,137.02	....	....
Ingersoll	25.50	468.6	91,475.69	3,624.07	2,136.90	1,136.72	6,897.69	4,123.11	11,020.80	12,440.39	1,419.59	....	....
Tillsonburg	32.00	191	70,907.83	2,778.69	752.79	498.65	4,030.13	1,680.57	5,710.70	6,233.68	522.98	....	....
Norwich	32.00	92.7	33,252.28	1,312.12	596.88	306.75	2,215.75	815.64	3,031.39	3,109.04	77.65	....	....
Beachville	31.00	84.7	19,675.09	778.20	463.68	285.19	1,527.07	745.26	2,272.33	2,624.39	352.06	....	....
London	24.00	3076.1	519,254.08	20,482.25	4,368.63	5,093.36	29,944.24	27,065.95	57,010.19	74,800.58	17,790.39	....	....
St. Thomas	29.00	1495.5	358,135.39	14,140.71	2,923.41	3,446.81	20,510.93	13,158.51	33,669.44	43,119.64	9,450.20	....	....
Port Stanley	9. + 243.67	91.6	45,670.03	1,811.97	561.21	247.69	2,620.87	806.03	3,426.90	4,279.19	852.29	....	....
Totals	......	37165.1	4,693,313.81	180,250.55	52,779.84	57,214.39	290,244.78	327,007.47	617,252.25	751,191.66	141,062.12	7,122.71	133,939.41

* Municipalities connected during 1913—first year's operation.

PORT ARTHUR SYSTEM

The progress of the Port Arthur System has been very satisfactory during the past year, and the outlook for the coming year is very promising indeed.

The percentage of interruptions for the year was very small and no failure of apparatus in the substation has occurred.

The new extension to this same station is practically completed and a number of improvements have been made in the original part of the station, which add considerably to the efficiency and the appearance of the station.

On September 20th, 1913, the new 22,000 volt line from the substation to the new Government grain elevator was made alive and found to be in first-class operating condition.

The load taken by this elevator is in the neighborhood of 1,000 h.p. at the present time with prospects of a big increase in the near future, as the installed capacity of the elevator substation is nearly 2,250 h.p.

Another important load operated from the substation will be that of the Port Arthur Elevator Company, which operates the C.N.R. elevator. This company have signed a contract with the City of Port Arthur for 400 h.p. and the construction of the line to this elevator is being pushed forward with all possible haste.

With the continuance of the growth of the System in Port Arthur, the power demand of Port Arthur through the Commission, exclusive of the municipal plant at Current River, will no doubt be considerably increased during the coming year.

The capital investment for the Port Arthur System to October 31st, 1913, is as follows:—

Transformer Station	$73,076 07
Transformer Lines	15,801 29
Interest during Construction	1,547 90
Grand total	$90,425 26

The operating and maintenance expenses from October 31st, 1912, to October 31st, 1913, are as follows:—

Interest	$3,242 09
1.8 per cent. Sinking Fund	1,458 93
Operation Costs	3,324 96
Cost of Power	31,367 08
	$39,393 06

A financial statement of operation from October 31st, 1912, to October 31st, 1913, is given below:—

Sum of monthly loads delivered and value, including charges for Administration, General Expense, Operation, Interest, Sinking Fund, and Depreciation	23,530 h.p.=	$41,716 01
Sum of monthly loads purchased and value, including Administration, General Expense, Operation, Interest and Sinking Fund	23,530 h.p.=	39,393 06
Surplus applicable to Depreciation Fund		$2,322 95

SEVERN SYSTEM

At the beginning of the past fiscal year there were but two municipalities, namely, Midland and Penetang, being supplied with power from the Severn System.

At the present time, however, the number of municipalities has been increased to seven, which indicates the growth of the Severn System during the past year.

The new municipalities now taking power from the Severn System are Collingwood, Barrie, Coldwater, Elmvale and Stayner.

The power required by the addition of these municipalities has raised the Commission's demand from the Simcoe Railway and Power Company, whose plant is located at Big Chute on the Severn River, about nine miles from a point where the Severn River empties into the Georgian Bay, to over double what it was last October, and thereby lowered the price to the municipalities due to the automatic reduction according to the terms of the contract.

The present total demand is 1,233 h.p. and the prospects are very bright that this amount will be again doubled in the coming year.

The operation of this System is carried on at the present time by means of a co-operative system between the municipalities and the Commission. The Commission employs a System Operator and Line Superintendent who is stationed at Waubaushene Junction, and who directs the general operation and line maintenance over the System. The System Operator acts in conjunction with the Chief Operator of the Power Company who is located at the Midland substation, and thus the whole System is operated as a unit.

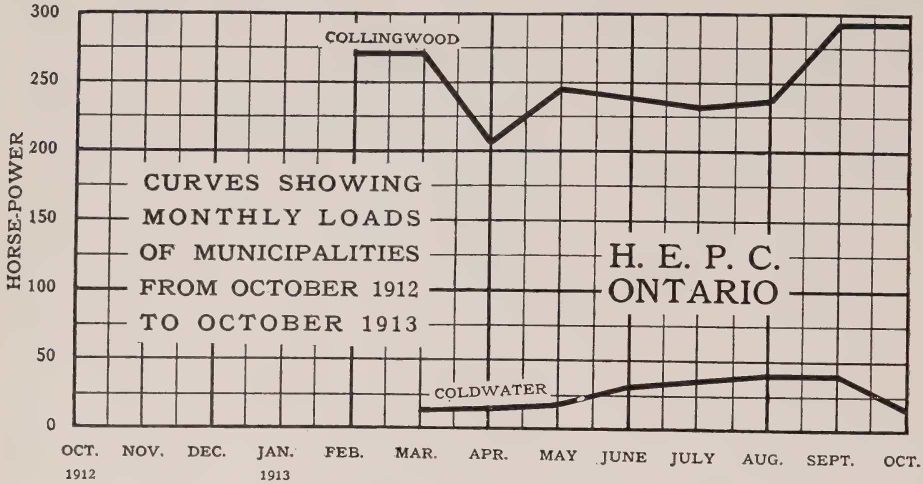
An agreement was arranged between the Commission and the municipalities whereby they would at any time furnish extra men to help the permanent staff on patrol and line repairs. Under the System Operator there are two patrolmen, located one at Elmvale and one at Stayner. With these two patrolmen located centrally on the System, and with the help which is furnished when necessary by the municipalities the Commission are able to keep the System in good operating condition.

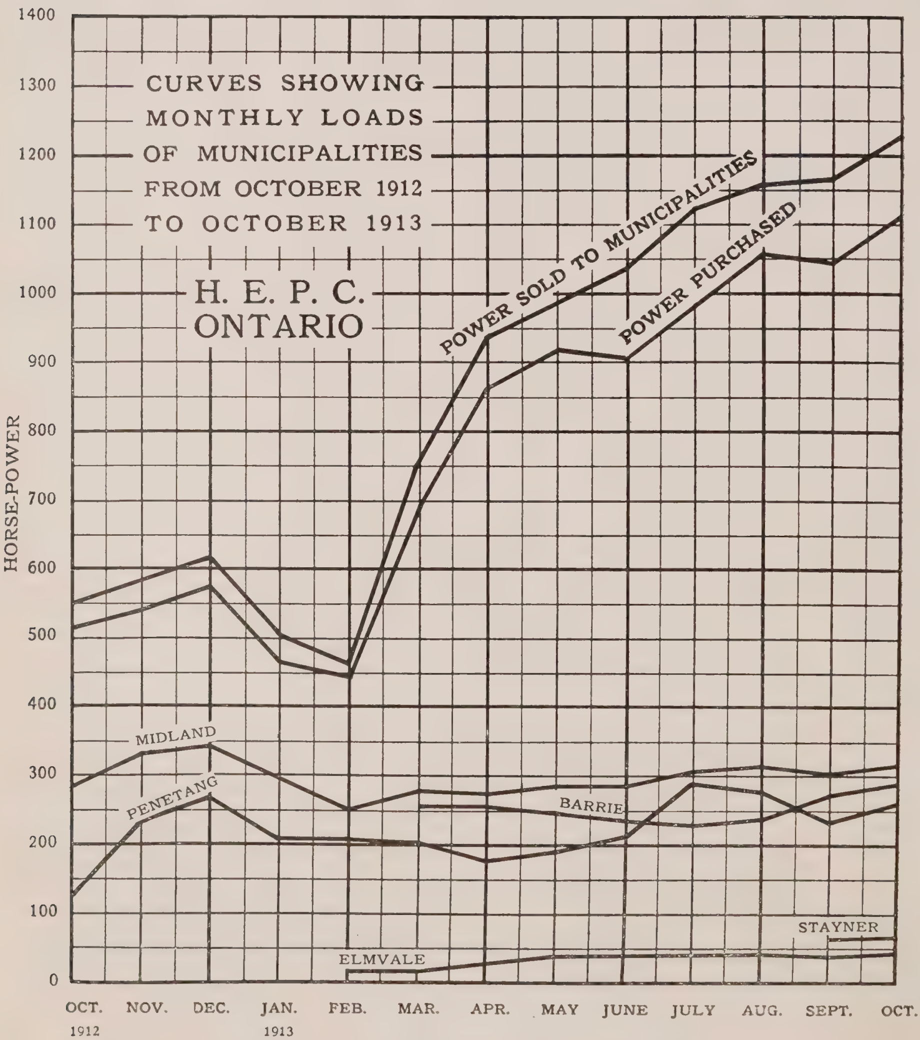
This system of operation and patrol has been found to work out very satisfactorily to the municipalities, to the Commission and to the Power Company.

The initial operation of this System was over a single circuit, 3 phase line to the different municipal substations. During the year the lines on this System have been double circuited. The necessary switching equipment for the lines on this System is being manufactured and when installed will add much to the efficiency of the operation and maintenance of power supply over this System. The addition of the switching equipment will give the choice of two lines throughout the System for the power supplied to the different municipalities.

The Simcoe Railway and Power Company are completing arrangements to dam the outlets from the Six Mile Lake to the Severn River, between the Big and Little Chutes. This work, along with other work carried out by the Power Company during the year, will give much better control of the water in connection with the operation of the plant during the spring freshet, which at times is fairly severe on this river.

The Power Company have also added to their power house equipment switching and transformer apparatus in order that they might be in a position to give the extended Severn System lines efficient service.


COLLINGWOOD
COLDWATER
CURVES SHOWING MONTHLY LOADS OF MUNICIPALITIES FROM OCTOBER 1912 TO OCTOBER 1913
H. E. P. C. ONTARIO
HORSE-POWER
300
250
200
150
100
50
0
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.


CURVES SHOWING MONTHLY LOADS OF MUNICIPALITIES FROM OCTOBER 1912 TO OCTOBER 1913
H. E. P. C. ONTARIO
POWER SOLD TO MUNICIPALITIES
POWER PURCHASED
MIDLAND
PENETANG
BARRIE
STAYNER
ELMVALE
HORSE-POWER
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
OCT. 1912
NOV.
DEC.
JAN. 1913
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.

A list of the municipalities connected to the Severn System during the past year is given below:—

Municipality	Date Connected	Initial Load in h.p.	Present Load in h.p.	Increase in h.p.
Collingwood	Feb. 24th, 1913	274.5	288	13.5
Barrie	April 10th, 1913	254.5	288	33.5
Elmvale	May 27th, 1913	33.5	33.5	......
Stayner	Sept. 25th, 1913	50	55	5
Coldwater	Feb. 24th, 1913	13.5	18.5	8

The capital investment for the Severn System to October 31st, 1913, is as follows:—

Midland Capital Cost Paid Up.

Penetang Capital Cost, October 31st, 1913.

Transmission Line	$9,136 71
Transformer Station	6,016 50
Total	$15,153 21

The maintenance and operating expenses from October 31st, 1912, to October 31st, 1913, are as follows:—

Cost of Power	$3,965 83
Interest	602 55
Sinking Fund	607 09
Operation Costs	99 96
Total	$5,275 43

A financial statement of operation from October 31st, 1912, to October 31st, 1913, is given below:—

Sum of monthly loads delivered and value, including charges for Administration, General Expenses, Interest, Depreciation and Sinking Fund	2,797 h.p.	=$6,323 84
Sum of monthly loads purchased and value, including Administration, General Expenses, Interest and Sinking Fund	2,775.5 h.p.	= 5,275 43
Surplus applicable to Depreciation Fund	21.5 h.p.	=$1,048 41

ST. LAWRENCE SYSTEM

The Eastern, or St. Lawrence System operated by the Hydro-Electric Power Commission of Ontario, extends from Morrisburg, where the Commission buy power from the Rapids Power Company, in westerly and northerly directions. The power lines run along the river from Morrisburg in a westerly direction a distance of 23 miles to Prescott, Ontario, and in a northerly direction as far as Winchester, a distance of 18 miles, and are at the present time being extended to Chesterville and Russell, about 18 miles further.

These lines are located so that they can be easily tapped for a power supply for the different municipalities in this district.

The plant of the Rapids Power Company is situated on the Canal at Morrisburg. Current is generated at 2,200 volts, 60 cycle, 3 phase, and is carried under the canal in an armoured cable to the stepup station. The voltage here is stepped up to 26,400 volts and the supply of power for the System is taken from the high tension side of the stepup station.

To date Prescott has shown a favourable increase per month. Prescott's distributing station is built alongside their old power house and now that Prescott has a supply of Hydro power they are taking the necessary step to remodel their old equipment to bring it up-to-date so that they will have an auxiliary steam operated outfit which can be operated in conjunction with the Hydro supply in case it is needed.

TOTAL CAPITAL COST TO OCTOBER 31st, 1913

Following is a statement of expenditures on capital account, including Niagara, Port Arthur, Severn, St. Lawrence, and Renfrew Systems, also Municipal Construction (chargeable), Stock on hand and Tools; together with Expenditures on behalf of Province and value of assets on same account.

Niagara System

Transmission Lines		
Right-of-Way	$564,345 20	
Steel Tower Lines	1,783,786 13	
Telephone Lines	129,681 69	
Relay System Lines	54,537 32	
Conduit System, Ontario Power Co. to Niagara Station	47,924 92	
		$2,580,275 26
Right-of-Way—Windsor Extension	41,578 04	
Steel Tower and Telephone Lines—Windsor Extension	111,691 96	
		153,270 00
Wood Pole Lines in operation	586,633 79	
Wood Pole Lines in course of Construction	181,280 69	
		767,914 48
Rural Line Construction		35,882 71
Welland District Lines		8,066 33
		$3,545,408 78
Transformer Stations		
Stations in operation	$1,511,340 85	
Stations and Extensions in course of Construction	60,443 19	
		1,571,784 04
Distributing Stations in Operation	$65,811 19	
Distributing Stations in course of Construction	7,854 97	
		73,666 16
		$5,190,858 98

Other Systems

Port Arthur Capital Cost		
Transmission Line	$15,801 29	
Transformer Station	64,249 49	
Extension to Station in Construction	10,374 48	
		90,425 26
Penetang Capital Cost		
Transmission Line	$9,136 71	
Transformer Station	6,016 50	
		15,153 21
St. Lawrence System		
Transmission Lines in Operation	$53,219 95	
Transmission in Construction and not operating	37,175 60	
Distributing Stations in Operation	2,906 09	
Distributing Stations in Construction	5 00	
Preliminary Survey on Steel Tower Lines	359 38	
		93,666 02
Severn System		
Transmission Lines	$194,185 57	
Distributing Stations	26,029 47	
		220,215 04
Wasdell Falls Power Development, Site and Construction		14,414 04
Wasdell District Wood Pole Lines, Engineering and Estimates *re* Proposed Construction		317 19
		$234,946 27

Renfrew System		
Round Lake Storage Dam Construction		17,761 88
Municipal Construction Chargeable		
Various Municipalities	$121,340 72	
Right-of-Way—Toronto Entrance	1,544 70	
		122,885 42
Storehouse		
Toronto Storehouse, Testing Laboratory, Garage and Machine Shop	50,322 25	
Dundas Storehouse	1,581 36	
		51,903 61
Stock and Tools		
Line and Station Construction—Stock on hand	$56,268 76	
Line and Station Maintenance—Stock on hand	15,976 78	
Line Construction, Tools and Camp Equipment	2,715 86	
		74,961 40
General Expense Accounts (Capitalized)		
Automobiles	$10,520 00	
Unexpired Insurance, autos	1,229 64	
Unexpired Insurance, employees	1,748 65	
Office Furniture and Equipment	7,175 42	
Stationery, Cameras, etc.	2,488 85	
		23,162 56
Total capital expenditures		$5,915,724 61

PROVINCIAL EXPENDITURES

Provincial Account for Fiscal year, 1912-13

Engineering assistance to Municipalities, advising on construction of distribution systems, estimating rates and accounting, including travelling expenses		$69,290 97
Hydrographic surveys, reports on stream flow and power sites for the Province		29,663 23
Rules and regulations for the installation of systems for the utilization of electrical energy		6,412 16
Practical demonstrations of the use of electrical energy on the farm, also in connection with Rural and Urban Exhibitions		7,079 72
Shop and development work on the improvement of apparatus, also testing of instruments and equipment, including lamps and meters		4,229 19
Illuminating engineering investigations, general and specific		597 03
Gathering of data and statistics for the compilation of the Annual Report, including General Publicity and European Report		5,120 67
Gathering of data and statistics, and preliminary surveying in connection with the projected construction of electric railways		9,814 81
Engineering assistance to Department of Public Works, including expenses of Engineers		627 63
		$132,835 41
Capital Expenditures		
Equipment for farm and rural demonstrations	$2,066 02	
Instruments, Hydraulic Department	3,152 50	
Instruments, Electric Railway Department	538 18	
		5,756 70
Total expenditure		$138,592 11

EXPENDITURES DURING FISCAL YEAR ENDING OCTOBER 31, 1913

Niagara System

Right-of-Way, including extension from St. Thomas to Windsor	$ 63,834 39	
Steel Tower Lines, including extension from St. Thomas to Windsor	103,391 36	
Telephone Lines	12 74	
Niagara Conduit System	7,017 04	
Wood Pole Lines	271,276 38	
Wood Pole Lines, Welland District	8,066 33	
Rural Line Construction	35,882 71	
Transformer Stations and Extensions	248,977 31	
Distributing Stations	35,862 36	
		$774,320 62

Severn System

Penetang Cap. Cost, including Line and Station	$ 140 46	
Trans. Line and Stations connecting Collingwood, Barrie, Coldwater, Elmvale and Stayner	190,703 53	
		190,843 99

Wasdell Falls District

Power Development Site and Construction	$ 14,414 04	
Transmission Lines connecting Beaverton, Cannington, Gamebridge, Brechin, Woodville and Sunderland	317 19	
		14,731 23

Port Arthur System

Extension to Station	14,363 77

St. Lawrence System

Transmission Lines and Distributing Stations connecting Morrisburg, Prescott, Winchester and Chesterville, and surveys	87,041 72

Renfrew System

Round Lake Storage Dam construction, Right-of-Way and Flood privileges	12,992 18

Miscellaneous

Municipal Construction chargeable to various Municipalities	105,840 75
Toronto Storehouse	50,322 25
Dundas Storehouse	1,581 36
Line Construction, Station and Maintenance, Stock on Hand	58,207 74
General Expense Accounts (capitalized)	23,162 56
	$1,333,408 17

CHAPTER IV

MUNICIPAL WORK

MUNICIPAL ADVICES

Municipal Department

The Municipal Department is employed to secure the necessary information for the preparation of estimates on the cost of supplying power to those districts desiring it, through data collected by surveys of the districts and investigations of the possible power demands. These investigations are made, and estimates submitted, at the request of the municipalities desiring power. After a contract for a supply of power has been made between the Municipality and the Commission, the latter acts as consulting engineer when so requested, and is expected to prepare engineering plans, specifications, call for tenders, and supervise the erection of the necessary material and apparatus. Later, after power is delivered, this Department aids the municipality in building up its power load by acting as a power solicitor, and advising the town and consumers regarding the amount of power necessary and the proper electrical equipment.

The standardization of apparatus, unification of rates, and the inauguration of standard accounting systems are also under the direct supervision of the Municipal Department, which is also expected to give advice on questions of an electrical nature at the request of any municipality in the province.

The Rates in use in the Municipalities served by the Commission, for the years 1912 and 1913, and also the Cost of Power to those Municipalities will be found on pages 156 to 162 of this report.

The results of the year's Operation in the Municipalities will be found in "Operation of the Systems," pages 61 to 82, and in "Municipal Accounts," pages 136 to 155 of this report.

The work accomplished by this Department during the period covered by the report is given in detail in what follows; the municipalities being arranged in alphabetical order:—

Acton

The reconstruction of the Acton distribution system to adapt it for use with Hydro power commenced early in December, all work being carried on under the supervision of this Department. The whole system which was old and badly in need of repair was rebuilt, a greater portion of the same being replaced by new materials. The old street lighting system had to be replaced completely, new brackets, wire and other equipment being installed to give an efficient system of lighting on all streets. New circuits were also run to take care of prospective power users.

The Acton line and station was connected on December 14th, 1912, and single phase power was given to the town temporarily for lighting purposes while their system was being overhauled. This work was practically completed in Acton by February 1st, 1913, after which three-phase service was given.

In addition to supervising the reconstruction of their distribution system, assistance was also given in connection with various details of management and of rate application, a number of prospective power users being interviewed to secure additional load for the town system.

Although this was a municipal plant before the contract was made with the Commission, the number of lighting consumers has increased very greatly during the 9½ months of operation under the new system. There are several power consumers, and although the amount of power used is comparatively small, it works in well with the lighting load, giving a good load factor.

Ailsa Craig

To ascertain the most economical method of serving Ailsa Craig, a number of estimates were made of the cost of transmitting power to this Municipality together with others lying close to it, including Granton, Lucan, Parkhill, Zurich, Hensall, Dashwood, Exeter Crediton, and Thedford. Various schemes have been considered using both London and St. Marys as distributing points. With the present load conditions in this district, no advantageous proposition has as yet been found.

Alliston

A resolution was received in December, 1912, from the Council of the Town of Alliston asking for an estimate of the cost of 150 h.p. delivered to that Municipality. An estimate was accordingly prepared, it being assumed that Tottenham would also take 150 h.p., but under these conditions the cost was found to be high. In July a representative visited Alliston, Beeton, Tottenham and Orangeville to make a study of their load conditions, and reported the following loads as the probable requirements of each place:—

Alliston	200 h.p.
Beeton	75 h.p.
Tottenham	50 h.p.
Orangeville	800 h.p.

Estimates are being prepared of the cost of supplying these quantities of power, including 100 horse power to Grand Valley.

Alvinston

A representative visited Alvinston who made a complete study and report on the power situation there, and on the probable requirements in case the Town entered into the Power Union. He advised that 165 h.p. was being used in the Town and that a probable load of 100 h.p. could be obtained for a Municipal Hydro-Electric System.

Amherstburg

Amherstburg was visited and the different manufacturers interviewed to obtain particulars in regard to the power used by each. It was reported that 375 h.p. was being used in the Town, which quantity would probably be increased to 420 h.p. in the near future. With the Town taking Hydro power they would have a probable load of 150 h.p.

The proposition of serving Amherstburg is being considered in estimates at present in hand of the cost of serving the various towns and villages in Essex County from the Essex high tension transformer station.

Ancaster Village

During the third week of November, 1912, a resolution was passed by the Police Village of Ancaster, asking for an estimate of the cost of power to that Municipality. No definite quantity having been stated, a representative visited the village soon after this, who reported their present probable requirements as 40 h.p. Estimates were then prepared of the cost of transmitting power to them, and in April, 1913, they were advised that the cost of different quantities of power, delivered at a voltage suitable for local distribution, would be as follows:—

40 h.p. — $31.55 per h.p. per year.
75 h.p. — $25.05 per h.p. per year.
100 h.p. — $22.95 per h.p. per year.

Appleby

See report on Nelson Township.

Aurora

On December 7th, 1912, a letter was sent to the Town Clerk of Aurora giving estimated costs of $24.97 per h.p. per year for 500 h.p. and $26.29 for 300 h.p., the power to be delivered at 13,200 volts. Power at 44,000 volts was, however, recommended in preference to the above, a rate of $26.78 per h.p. per year for 300 h.p. being given for power at this voltage.

Consequent to this the Town Council also considered a proposition submitted to them by a power transmission company, which latter proposal was believed by them to be the more desirable. Accordingly on June 30th they carried a by-law authorizing an agreement with the transmission company.

Ayr

A resolution having been received from the Council of the Village of Ayr, asking for an estimate of the cost of transmitting 100 h.p. to them, a number of estimates were prepared in an endeavor to find the most economical means of service. With Ayr taking power alone an advantageous proposition could not be given, so the Department was asked to interest other municipalities in that district. With this end in view a representative visited these towns and addressed meetings in reference to Hydro-Electric power. As a result the enabling by-law was carried in a number of places in July, it being carried in Ayr by a large majority. A study is now being made of the proposition of serving the municipalities as a group, and estimates are in the course of preparation.

(See report on Blenheim Township).

Baden

During March, 1913, a number of prospective power customers were interviewed on behalf of the Village with the result that a contract was signed in April by one manufacturer for over 150 h.p. 24 hour power, and by others for smaller amounts. Owing to this increased load, a substantial reduction of rates to power consumers was recommended.

Early in June changes were made in their local distribution system, since the sub-station transformer connections had to be changed to give 4,000 volts, so that Petersburg and St. Agatha could be served from this point.

Extensions were also made in the local distribution system to take care of the new power consumers, the Department acting in an advisory capacity. Assistance was given the new power consumers in choosing their electrical equipment and laying out their installations.

It is of interest to note that two years ago Baden entered into an agreement for the supply of 40 h.p. For the last month of this year they have taken 165 h.p. and with the completion of the motor installations at present in hand it is expected that their demand will reach 200 h.p.

Barrie

The Commission, acting in the capacity of Consulting Engineers for the Town, called for tenders for their sub-station transforming and switching equipment, and after contracts were let and materials had arrived, supervised its installation. Power was received on April 14th, when the inauguration of Hydro-Electric power was celebrated by a public meeting and a demonstration.

Assistance has been given the local Commission in obtaining new power users, and the officials were instructed in the use of the schedule of rates recommended for their use.

The street lighting system was overhauled and construction work started on the installation of 500 additional lamps with new transformers to take care of them, special lighting having been placed on the main street. Assistance has been given in planning this work.

It was proposed by the local authorities to do away with the existing waterworks' pumping station, and install pumps at their transformer station, thereby effecting economies. The Commission was asked to advise on this matter, and after the question was gone into thoroughly, recommendations were made along the lines suggested. These recommendations met with the approval of the Town and tenders have been called for covering the equipment required.

Beachville

During the year a representative visited Beachville at regular intervals and advised them on various questions of management, in addition to assisting them in obtaining power load and laying out extensions to their local distribution system to give the required new service.

Beachville load has increased during the year from 27 h.p. to 100 h.p., while their business has been placed on a substantial paying basis. Their original contract calls for the supply of 80 h.p.

Beamsville

See Report on St. Ann's District.

Beaverton

As a result of the meetings held in the different towns and villages in Ontario County during the summer and fall of 1912, the Village of Beaverton carried the enabling by-law on November 18th by a large majority, the vote being 154 for and 3 against.

Soon after this an inventory was taken of the local distribution system and plant and a valuation made of it. An estimate was also made of the cost of new work and reconstruction within the Village to adapt their old system for the use of Hydro-Electric power. The Corporation was submitted a recommendation that \$10,000.00 be raised to take care of this work. Representatives of the Commission addressed ratepayers' meetings during December in reference to Hydro-Electric matters, explaining the various points of interest in connection with their money by-law on which a vote was about to be taken. This by-law to authorize a debenture issue for \$10,000.00 to be expended for an electric distribution system was carried almost unanimously early in January, 1913.

A contract for the supply of 250 h.p. at 2200 volts and at an estimated cost of \$32.71 per h.p. per year was drawn up and submitted to the Corporation, which was signed.

Beaverton is to get its supply of power from Wasdell's Falls on the Severn River where development work is at present going on. Preparations are being made to have the sub-station and municipal distribution system as well as transmission lines finished in time to receive power upon the completion of the Wasdell's Falls plant.

Beeton

A resolution asking for an estimate of the cost of transmitting 150 h.p. to the Village of Beeton was received. The question of supplying this power is being taken care of in the study of the conditions in the municipalities in this neighborhood. (See Report on Alliston.)

Belmont

In response to a request for information as to the procedure to be followed to obtain a supply of Hydro-Electric power, a representative was in Belmont during April who gave the Village Trustees the instructions desired. While there, a study was made of the local power conditions, a report on which placed the probable demand of the village at 50 h.p. in the event of their installing a Municipal Hydro-Electric System.

Belle River

A representative visited Belle River and reported that a total of 120 h.p. was being used there, which quantity it was expected would increase to 185 h.p. In the event of the Municipality contracting with the Commission for a supply of power, a probable load of 75 h.p. could be obtained for a Municipal Hydro-Electric System.

Estimates of the cost of power to Belle River have been prepared in connection with the proposition of supplying the towns and villages in Kent County from the high tension transformer station at Chatham.

Berlin

During February a representative was in Berlin who obtained data in regard to their various power users, and a complete study was made as to the result that would be obtained by the application of the new schedule of rates that had been recommended to them. A number of conferences were held with officials of the Municipality, after which it was decided to adopt the rates as recommended.

Assistance was also given the Municipality in obtaining a contract with a prospective consumer for a large block of power, and engineering advice was given in regard to making additions to their local distribution system to serve this cus-

tomer. A number of conferences were held in connection with this work, representatives of the Commission also visiting Berlin a number of times to take care of various details that had to be handled locally,

The question of rates to be charged to residents of Bridgeport, a suburb of Berlin, was referred to this Department for attention, and instructions were given that were acted on by the local Commission.

The Commission was requested to advise the local authorities on the question of the Municipality purchasing the plant of the Berlin Central Heating Company, to be used as a reserve source of power or a peak load station. A careful inspection was made of this plant and all details examined both from the physical and from the financial standpoint. A complete report was made on the situation and recommendations sent to the local Commission.

At the city's request the question of redesigning the municipal sub-station and feeder system, to increase the protection to their circuits and to provide for future growth has been taken up. It is also proposed to install voltage regulators on the lighting circuits. Preliminary work in connection with this proposition is in hand, this Department working in conjunction with the local Superintendent.

A very satisfactory growth in business has taken place during the past year, and there is every prospect of further growth both from new industries locating in Berlin, and from industries now using steam or part Hydro power. A corresponding growth has taken place in the municipal load which during 1912 was 1,206.5 h.p. During the present year this has been increased to 1,468 h.p. With the addition of the loads at present being connected it is expected their demand will exceed 1,600 h.p.

Blenheim

A representative was in Blenheim who made a complete survey of the power situation in that Municipality. He reported that 325 h.p. was being used, which amount would be increased to 465 h.p. in the near future. Should the Municipality enter into a contract for a supply of electric power, a load of approximately 150 h.p. could be obtained for a Municipal Hydro-Electric System.

The proposition of supplying Hydro power to Blenheim is being considered in connection with the other municipalities in Kent County.

Blenheim Township

In compliance with a request from the Clerk of the Township of Blenheim, forwarded to the Commission during April, a representative visited the Township in the early part of May. While there he addressed a number of meetings on the question of Hydro Power, outlining the procedure to be followed to obtain a supply, and also made a survey of the power requirements of the villages within the Township. It was reported that the following quantities of power were required by these villages:—

Drumbo	23½ h.p.
Plattsville	77 h.p.
Princeton	25 h.p.

Bothwell

The power conditions in Bothwell were investigated, and it was reported that 300 h.p. was being used, and that there was a possibility of this load being increased to 330 h.p. in the near future. The possible load for a Municipal Hydro-Electric System was reported as approximately 150 h.p.

Estimates of the cost of Hydro Power to Bothwell, supplied from the high tension transformer station at Chatham, have been prepared. These will be submitted to the Municipality in the near future.

Bobcaygeon

The local plant having been destroyed by fire in December, the Commission's advice and assistance were sought for the purpose of obtaining a supply of electricity at the earliest possible date. A representative went to Babcaygeon immediately, who advised them of a possible means of obtaining a temporary supply of power, and also obtained data whereby plans could be drawn up and materials ordered for the restoration of their plant.

In January the Board of Electric Light Commissioners forwarded a resolution that the Commission be asked to take care of the restoration of their Electric Plant and also give them any further assistance they might require.

A study was made of their conditions and recommendations made in regard to changes necessary in their street lighting system. Plans were also drawn up for a new generating station and equipment, and supplies ordered for them. After their equipment had arrived the Commission made the installation and turned the plant over to the town in complete operating condition.

Bismark

See Report on St. Ann's District.

Bradford

Meetings were held in this place at which representatives of the Commission were present and explained the method of procedure necessary to obtain a supply of Hydro-Electric power. An estimated cost of $43.24 per h.p. per annum being quoted.

In view of possible delay in furnishing Hydro-Electric power to Bradford, the Commission suggested in March that a second-hand generator might be purchased and belted to some steam engine in the village so that current could be supplied temporarily.

Brampton

During the year Brampton was given considerable assistance in soliciting new power consumers and in laying out extensions to their Municipal System to serve them. Their load has shown a steady healthy growth, their demand having increased from 373.5 h.p. in 1912 to over 500 h.p., and with the addition of the load to be taken by motors at present being installed it is anticipated that an even greater increase will be shown in the coming months.

A schedule of rates was recommended to Brampton conforming with the standard form. This system of charge being different from that previously used, a number of conferences were held for the purpose of discussing them and to ascertain the effect they would have on consumers' bills. The rates as recommended were finally adopted by the town and put into force.

Brantford

In November an agreement was signed by the City of Brantford for the supply of 1,200 horse-power to the Municipality at an estimated cost of $19.50 per horse-power per year.

A Superintendent was appointed in December to take charge of all the work in connection with the installation of their transformer station and local distribution and street lighting systems. Under his supervision plans were put under way covering all this work, the Commission's Engineering Department acting in an advisory capacity. A great many points in connection with the work were discussed in detail and plans and specifications were prepared for the Municipality's transformer station and the underground street lighting system in the business section.

Construction work in Brantford is progressing rapidly, and will be ready for service upon the completion of the Commission's transformer station and transmission line.

Brantford Township

The Township Clerk forwarded a resolution, passed on April 10th, 1913, asking what steps should be taken to have streets in the suburban districts of the city of Brantford lighted, and to obtain current for the use of farmers. Instructions as to method of procedure were given at that time. Early in August a rural petition was received from the Township asking for rural power and lighting service. Conditions are being investigated and estimates are being made of the cost of giving the desired service.

Brechin

The enabling By-law was passed by the ratepayers of the Police Village of Brechin in November, 1912. Estimates were prepared of the cost of a distributing system for the Village, which were submitted, and on January 21st, 1913, a By-law carried authorizing an issue of debentures for $1,750 to cover this work.

An agreement covering the supply of 50 h.p. to the Village was drawn up and submitted. This agreement was executed in April.

Brechin will be served from the development at Wasdell's Falls on the Severn River.

Breslau

An agreement was drawn up and signed for the supply of 100 h.p. to a Brick Company located at Breslau, which power is to be supplied at 2,300 volts and at the rate of $35.00 per h.p. per year. A transmission line has been built from Preston, and a transformer station located in the village. Rural consumers in Waterloo Township will also be served from this line. (See Report on Waterloo Township.)

Brigden

A representative visited Brigden who reported that 235 h.p. was being used there, and that a probable load of 100 h.p. could be obtained for a Municipal Hydro-Electric System.

Bronte

Preparatory to asking the Council of the Township of Trafalgar to consider a by-law to get Hydro-Electric power for the Police Village of Bronte, a representative visited that Municipality to address ratepayers' meetings and instruct the Village Board on the steps to be taken. It was proposed to submit a by-law to the people at the January, 1913, elections, but owing to some misunderstanding the Township Council failed to give the by-law the necessary readings. Since then no further action has been taken on the part of the village.

Bright

Acting on a request from the Police Village of Bright, a representative visited that Municipality in April, 1913, and addressed a meeting of the ratepayers on Hydro matters, explaining the method of procedure to be followed to obtain a supply of power. He also made a study of the local conditions and reported the present power requirements of the village to be about 50 h.p.

Caledonia

Construction work on the Caledonia Village Distribution System was commenced in November, being carried on under the supervision of this Department. Work was completed during the next month to such an extent that electric service could be given to residences.

Assistance was given the Village in obtaining power consumers, and the officials were instructed in the various details of management and rate application.

Although Caledonia contract covers the delivery of 25 h.p., their demand to date has reached 27 h.p. and from present indications it is anticipated that this amount will be increased in the near future. In addition to the small amount of power taken by the Village, the Commission has a contract with a manufacturer outside the Village limits of Caledonia for 300 h.p. from which Caledonia benefits. The demand of this company has been automatically increased to 375.5 h.p.

Camden

See report on St. Ann's District.

Cannington

Following the preliminary steps reported in 1912, an enabling By-law was passed by the Village of Cannington by a majority of 136, three voting against.

It was arranged that the Village should take over the distribution system owned by a private company, and estimates were prepared of the cost of remodelling and reconstructing it for use with Hydro-Electric power. Acting on the advice of the Commission, a By-law to authorize an issue of debentures for $12,000.00 was submitted to the ratepayers in April, which carried by a majority of 117, there being 21 dissenting votes.

An agreement covering the supply of 175 h.p. to the Village was submitted and executed.

Power will be supplied to Cannington from the development at Wasdell's Falls, and it is planned to have their distribution system ready to receive power as soon as that work has been completed.

Cayuga

A request having been received from the Town of Cayuga, asking information as to the cost of transmitting Hydro-Electric power to them, and a similar request having been received from a local manufacturer as to the cost of 100 h.p. at Nelles Corners, near Cayuga, estimates were put in hand to ascertain the cost of this latter amount, with 50 h.p. delivered to Cayuga. It was found that under these conditions an advantageous proposition could not be given. It was decided that a more extensive study be made of this district before final estimates are submitted.

Chatham

Acting on requests from Chatham, a representative visited that municipality during February, who made a complete detailed report on the various power conditions existing there. This report covered the following headings:—

The franchise of the present Company.

The number of consumers and the service given to various classes of customers.

The source of power of the present Company, giving details of the cost of fuels, etc., load conditions on their plant and the rates in use.

Details of the generating plant and distribution system, with a valuation of the same.

The cost of generating power, using the present equipment.

Approximately 3,100 h.p. are being used for industrial purposes in Chatham. Many of the manufacturers generating their own power by means of gas engines, or by steam engines, using refuse and gas to fire their boilers.

Our representative also obtained data and reported on the municipal street lighting system and the water pumping system.

In April an estimate was made of the cost of reconstructing the present distribution system to adapt it for use with Hydro power, of the cost of remodelling their street-lighting system and of installing underground circuits with ornamental street lights in the business districts. It was estimated that $89,729.00 would be required for this work.

A request was received from the City of Chatham, instructing the Commission to enter into negotiations with the present Company in an endeavor to come to some arrangement whereby the municipality could buy out the company. A valuation has been made of the assets of the company and negotiations are at present in hand.

Chatsworth

A representative visited the Village of Chatsworth who reported that a probable load of 75 h.p. could be obtained there for a municipal Hydro-Electric System. (See report on Owen Sound.)

Chesterville

An estimate of the cost of a distribution system was forwarded to the Village in April, together with a recommendation that a by-law for $5,000 to cover the cost thereof be placed before the people. This by-law was accordingly submitted to the ratepayers on May 31st and carried, the vote being 111 for and 21 against.

A contract has been signed covering the supply of 50 h.p. to Chesterville at an estimated cost of $35.00 per h.p. per year. Construction work necessary to give this service is at present being rushed forward, and it is expected that power will be delivered within the very near future.

Clinton

In November, 1912, an agreement was prepared and forwarded to the Town of Clinton, which provided for the supply of 400 h.p. to that municipality at an estimated cost of $39.00 per h.p. per year. It was felt that 400 h.p. was rather too large an amount of power for this town to contract for, so after further investigation it was decided that a new form of agreement be drawn up. This latter agreement was submitted in March, 1913, covering the supply of 300 h.p. at an estimated cost of $41.00 per h.p. per year, which agreement was executed in May.

Single Light Park Standard, Goderich

Single Light Park Standards, Goderich

At a meeting held on December 16th, 1912, it was decided to submit a money by-law for 33,000.00 for the purchase of the existing plant, and remodelling it for the reception and distribution of Hydro-Electric power. A representative visited Clinton soon after this, who made recommendations as to changes to be made in their distribution system for the reception of this power, and also obtained data on which to base the design of a municipal transformer and distributing station.

Plans and specifications were submitted to the Town Council for approval, and orders have been placed for the equipment and supplies necessary to remodel and construct their system. Construction work has commenced under the supervision of this Department, and will be completed early in 1914. The new station apparatus is being placed in the Waterworks Building, and the operation of both systems will be under the supervision of one man.

Coatsworth

See Report on Merlin.

Coldwater

The Coldwater Municipal System was made alive on February 18th, 1913, after which continuous service was given.

Since that time they have been working up a power and lighting business, a representative having visited the village at various times to advise the local officials on any details concerning which they were in doubt. It is anticipated that during the coming year the electrical department of the Village of Coldwater will have been placed on a substantial basis.

Collingwood

The reconstruction and remodelling of the Collingwood local distribution and street lighting systems, which was started during the late summer of 1912 was completed early in the present year. Extensions were also made to take care of some new power consumers. All of this work was carried on under the supervision of this Department.

Power was first received in Collingwood on February 24th, that event being celebrated by a demonstration and official opening.

A representative has continued to visit Collingwood at regular intervals to advise them in the various details of management and give them any engineering advice they should desire. A number of prospective power users in the town have been interviewed on behalf of the local Commission with the object of soliciting additional load for the town system.

A large number of small power users have been connected to the Collingwood Municipal system and new lighting consumers have continued to come on at a rapid rate. Some contracts have also been signed for large quantities of power. Service will be given to these latter as soon as they have completed their motor installations. With the addition of these loads it is anticipated that the load taken by Collingwood will exceed the amount covered by their contract.

Comber

A representative visited Comber and reported that 295 h.p. was at present being used there, which amount would be increased to 325 h.p. in the near future.

The proposition of supplying Comber with power from the Kent high tension transformer station, along with other municipalities in that district, is now under consideration.

Crediton

See Report on Ailsa Craig.

Creemore

A resolution having been received from the Village of Creemore asking for an estimate on the cost of transmitting power to them, a representative visited the municipality and reported on the local conditions. He advised that a probable load of 50 h.p. could be obtained for a municipal Hydro-Electric System. An estimate is being prepared of the cost of delivering this amount of power to the municipality.

Dashwood

See Report on Ailsa Craig.

Dereham Township

A request for information and, later, a petition for power containing 45 signatures, were received in February, 1913, the petition calling for service for 111 horse-power and 730 lights. Another petition containing 156 signatures was received in March, the total service requirements being for about 1,760 lights and some 380 h.p. Additional petitions are being circulated in an endeavor to get applications to cover the whole Township. After these are received a study will be made of the conditions existing to ascertain the best means of giving this service. In the meantime a study is being made of those portions of the Township covered by the petitions already received.

Doon

The contract between the Doon Twine Co. and the Commission being executed in November, 1912, orders were placed for the necessary equipment and the construction of the line was commenced. This was completed and ready for operation in February, 1913. The Commission's engineers also acted in an advisory capacity for the company, assisting them in choosing their equipment and planning their installation.

Power was first delivered to this company in April, after which their contract was turned over to the Town of Preston who assumed all the responsibility of management and operation of the line over which this load is transmitted.

(See report on Preston).

Downie Township

A number of estimates were prepared covering different schemes of serving the various applicants in this Township. In connection with this work a representative visited the Township who noted the location of every petitioner.

Permission was given to the City of Stratford to extend their system to serve some residents in Sebringville until such time as the Township should take over the business. Construction work on the Sebringville line has been completed and the residents in this portion of the Township are now enjoying the use of Hydro-Electric power.

(See report on Stratford).

Dorchester North Township

In compliance with a request from the Township of North Dorchester, a representative addressed meetings of the ratepayers on Hydro-Electric power in rural districts. As a result of these meetings, rural petition forms were circulated which when received contained 307 signatures, requesting service for 2,796 lights and 462½ h.p. Estimates are being prepared for the cost of giving this service.

Dresden

A complete report was made on the power conditions in Dresden, giving details of the equipment in the municipal electric plant, the rates in use and the operating costs. It was reported that 440 h.p. was at present being used, which amount would be increased to 540 h.p. in the near future. In the event of the municipality contracting for a supply of power through the Commission, a probable load of 200 h.p. could be obtained for their municipal system.

Estimates of the cost of Hydro power to be supplied to Dresden from the Kent high tension transformer station have been prepared and will be submitted to the municipality in the near future.

Drumbo

It is noted in the report under Blenheim Township that the Police Village of Drumbo passed the enabling by-law. Soon after this a representative visited the village and obtained data on which to base an estimate of the cost of a distribution and street lighting system. This estimate will be submitted at an early date.

Dunnville

See Report on St. Ann's District.

Dundas

The question of building a line from Dundas to West Hamilton to give power and lighting service in that district was taken up. It was estimated that $8,000.00 would cover the cost of the necessary construction. The Town of Dundas expressed a desire to take charge of this business, and it was arranged they should do so, constructing the lines to give the necessary service. This work was carried out under the supervision of this department. The question of giving street lighting service in this district is now under consideration. (See report of West Hamilton.)

Owing to the rapid growth of the Dundas municipal load, the Commission, at the town's request, obtained tenders on 3-150 kv-a. 13,000/2,300/575 volt transformers, with a view to this size of transformers being installed in place of the existing 3-75 kv-a. transformers. As soon as these tenders were received they were submitted to the Dundas Commission with comments and recommendations. Orders have been placed for this equipment, which will be put into service with as little delay as possible.

During the latter portion of May and the first part of June, engineers in the employ of the Commission visited Dundas to make a complete inventory of the equipment of a private company operating there. This inventory was used as a basis of valuation to be used in arbitration proceedings between the company and the Town of Dundas. During these proceedings the Commission's engineers also appeared in the capacity of expert witnesses on behalf of the town.

Since the agreement between the town and the private company for street lighting is about to expire, and since the town proposes to take over this business at that time, assistance and advice were given in laying out a system of their own to be operated in conjunction with their power and lighting distribution systems.

Further assistance was given during the year in connection with various details of management. The Commission had recommended that their system of rates be changed, and in order to demonstrate the advisability of this, an analysis was made of their business, dealing with the load of each individual consumer. The rates as suggested were finally adopted.

The load in Dundas has shown a very satisfactory growth, their demand having increased from 127 h.p. taken in 1912, to 268 h.p. for the present year. In addition to this latter amount a demand of 389 h.p. has been created by manufacturers in Dundas supplied directly by the Commission, making a total demand for Dundas of 657 h.p. It is anticipated that their load will show a further increase in the immediate future. The Dundas contract covers the supply of 600 h.p.

Durham

A representative visited Durham who reported that a probable load of 200 h.p. could be obtained there for a Municipal Hydro-Electric system.

(See also Report on Owen Sound).

Eastwood

A representative visited Eastwood and reported on the power conditions there. It was reported that a probable load of 40 h.p. could be obtained there.

Elmira

An estimate of the cost of a distribution system was furnished by the Commission on November 9th, 1912, and a recommendation was made that $16,300 should be raised by debentures to cover the cost of this work. On the request of the village the existing privately-owned plant was valued by this Department. The question of taking over this plant was discussed at a meeting of the Council in December, one of the Commission's Engineers being present, and it was then decided to submit a money by-law in January, 1913, for $20,000.

The village arranged to purchase the local electric lighting plant and entered into a contract with the Commission for the supply of 200 h.p. at 2200 volts at an estimated cost of $38.00 per h.p. year.

The Council passed a resolution empowering the Commission to order materials, apparatus and equipment and to plan the local distribution system and also to construct the same. Materials were at once put on order and the construction of their local distribution was commenced on May 1st under the supervision of this Department.

During May, a representative visited Elmira who reported on their waterworks pumps, and made recommendations as to their future needs. Prices of pumping outfits were obtained and submitted.

Construction work in Elmira has been completed and was made alive on October 29th. Assistance is now being given the town in an endeavor to work up a power load.

Elmvale

The Police Village of Elmvale entered into an agreement with the Commission for the supply of 125 h.p. at an estimated cost of $31.00 per h.p. per year, power to be delivered at 2,200 volts, this being a voltage suitable for local distribution.

The work of reconstructing and remodelling their distribution system was carried out under the supervision of this Department, and power was first delivered on May 27th.

Assistance has been given to the Village trustees in connection with various details of management, rate application and soliciting of power consumers, a representative visiting the Village a number of times for that purpose.

Elora

A resolution was carried by the Council on February 10th, requesting the Commission to quote the cost of 100 h.p. per h.p. year. An estimate was accordingly prepared and submitted to the village showing that power could be supplied to both Elora and Fergus at the following figures:

Elora, 200 h.p.	$33.67 per h.p. per year
Fergus, 200 h.p.	$33.67 per h.p. per year
Elora, 100 h.p.	$52.06 per h.p. per year
Fergus, 100 h.p.	$52.06 per h.p. per year

During June a representative visited Elora making an inventory of the local distribution system, and obtained other data from which a valuation of the present plant was made and also an estimate of the cost of remodelling the system for the reception and distribution of Hydro power. The result of this valuation and estimate was forwarded to the Municipality in July, together with a suggestion that they submit a money by-law for $10,000.00 to cover their work.

A money by-law for the above amount and the enabling by-law will be voted on on November 3rd.

Essex

The Town of Essex was visited by a representative who reported on the power situation there and on the local electric light system. At that time 225 h.p. was being used in the municipality, which amount would be increased to 250 h.p. in the near future. Estimates of the cost of Hydro power supplied to Essex from the Essex high tension transformer station near Walkerville have been completed and will be forwarded to the Municipality at an early date.

Etobicoke Township

A number of petitions were received from Etobicoke Township requesting estimates on lighting, power and street lighting service to districts around Mimico and near Weston. These estimates were prepared and submitted to the Township Council, and after discussing the various propositions with the Township representatives, it was decided to give service to certain districts near Mimico. The construction work first decided on has been completed, having been carried on under the supervision of this Department, and service is being given. A number of extensions are contemplated which will be made in the near future.

All lines that have been constructed in this Township have been turned over to the Village of Mimico for operation and management, it being agreed that the Township shall have the liberty of taking them over at any time they should wish to do so, making them a portion of a township system.

Exeter

For the purpose of giving information on which to base a money by-law, a representative visited Exeter and obtained data from which a valuation of the existing plant was made and also an estimate of the cost of reconstructing and remodelling it for use with Hydro-Electric power. A complete report containing this valuation and estimate was submitted to the Village together with instructions as to preparing their money by-law, it being understood that the by-law would be submitted at the January, 1913, elections. No further action was taken by the Village in the matter.

(See also Report on Ailsa Craig.)

Fenwick

See Report on St. Ann's District.

Fergus

In preparing estimates of the cost of power to Elora, it was assumed that Fergus would take power also, and accordingly the figures submitted to Elora in March were sent to Fergus. (See Report on Elora).

Having been requested by the Municipality to do so, a representative visited Fergus during March making a study of their local conditions, and obtained data from which a valuation was made of their present system and an estimate of the cost of remodelling it for the reception of Hydro power. It was reported that 200 h.p. were required to fill their present needs.

In July the Municipality was advised to raise $16,000 to carry out the work required. A money by-law for this amount and the enabling by-law will be voted on on November 3rd.

Fletcher

See Report on Merlin.

Flesherton

A representative visited the Village of Flesherton who reported that a probable load of 125 h.p. could be obtained for a Municipal Hydro-Electric System, provided service was also given to Eugenia and Ceylon from this point.

(See Report on Owen Sound).

Finch

The question of supplying power to Finch was taken up in the study of conditions in the various towns and villages in the vicinity of Prescott. It was found that with the conditions existing and the small load required by Finch, viz., 50 h.p., an advantageous proposition could not be given them at this time.

Finch Township

An application was received from the Council of the Township of Finch asking for an estimate on the cost of power to the Village of Crysler. A study was made of this proposition, but owing to the limited power requirements in that district and the small amount required by Crysler, viz., 50 h.p., it was found that service could not be given at a reasonable cost.

Forest

A representative visited Forest during March and reported on the local conditions and on the present electric lighting system. The Town Council was advised in regard to the intended purchase of this system and also as to a power supply to fill their needs temporarily until such time as Hydro power would be available.

Fonthill

While at Fonthill for the purpose of addressing ratepayers of the Township of Pelham on the use of Hydro-Electric power in rural communities, a representative investigated the power requirements of that village. It was reported that a probable demand of 20 h.p. could be obtained for a village Hydro-Electric System, which if certain works that were being contemplated were carried out would be increased to 50 h.p.

(See Report on St. Ann's District).

Fort William

A communication from City Clerk of Fort William was received in January, asking for full information regarding the price of power to the City of Port Arthur and an interpretation of certain clauses in the contract with the Kaministiquia Power Company. They also requested that an Engineer be sent to investigate the local power situation and make a report on it. An Engineer was sent who reported in detail. This report was sent to Fort William, giving details concerning all matters regarding which inquiries were made.

A communication from the City Clerk was received in September requesting an estimate on the cost of supplying the City with 1,000 h.p. with a further supply of 1,000 h.p. each year for next four years, making a total at the end of four years of 5,000 h.p. at either 22,000 or 2,200 volts. Estimates in response to this request are being prepared and will be sent to Fort William in the very near future.

Galt

The town of Galt having agreed to supply the Grand Valley Railway with power, the question of drawing up a proper form of agreement for this power was referred to the Commission, and after terms had been settled to the mutual satisfaction of all parties, a contract was executed embodying them. Assistance was also given the town and the Company in choosing and laying out equipment to be installed to give the required service. After completion the installation was thoroughly inspected to see that it was placed in first-class condition before operation commenced.

A representative supervised the installation of their waterworks pumps and motors and gave such advice as was needed from time to time regarding the various details.

Tenders that had been received by the town for additional station transformer equipment were submitted to this department for comment, and recommendations were made and submitted.

Being desirous of removing the pole lines from some of their business streets and installing underground systems with ornamental street lights, an engineer spent some time in Galt in the early part of the summer looking over the local conditions and obtaining the necessary data. Suggestions and recommendations were carefully prepared which were submitted to the town for their consideration.

Other assistance was given the Town in connection with details of management, laying out extensions and soliciting new power consumers, a representative calling there at intervals for that purpose.

Their load has continued to show a substantial growth, the maximum load taken during the year being 1,025 h.p., while that in 1912 was 643.5 h.p.

Gainsboro Township

In January, 1912, the Council requested that an Engineer be sent to confer with them on the subject of Hydro-Electric power. This request was complied with by the attendance of a representative at the Township Council's meeting on March 10th at St. Ann's.

Georgetown

On November 11th, 1912, a vote of the ratepayers of Georgetown was taken on the necessary enabling and money by-laws for a supply of electrical energy by the Commission and for the building of a local distribution plant. Both these measures were carried by large majorities on December 23, 1912, after which an agreement was signed by the Municipality for the supply by the Commission of 200 h.p. of electrical energy at 2300 volts at an estimated cost of $36.00 per h.p. per year.

Plans for a complete distribution system for the transmission of electric light and power throughout the Municipality had, in the meantime, been prepared by engineers of the Commission, and these being satisfactory the municipality requested the Commission to purchase all necessary material and to proceed with the construction. The Commission also took up the question of the purchase by the Municipality of the existing local plant. After a number of conferences in which the Commission was requested by both parties to take part, an agreement was reached whereby the Town took over all that portion of the plant within the Corporation limits. Construction was started on April 13th, 1913, following out the original plans. As each section was completed the load was transferred to it and the old equipment removed from the streets. During this period and up to the time of turning on Hydro power, the local company continued to furnish power and to handle the business generally. These arrangements worked out very satisfactorily and there was practically no interruption of power during the period of construction. A sub-station site was selected and the work of erecting the station with its equipment commenced on May 11th, under the supervision of this Department.

On August 4th all work was practically completed and Georgetown received its first supply of Niagara power.

Since the completion of the work originally planned a representative of the Commission has continued to visit Georgetown at regular intervals to assist the Municipality in building up the load, soliciting power contracts, etc., and also advising them on any points that come up in connection with the management of their Municipal system.

During the period of less than three months since the Corporation took over the business there has been a very rapid increase in the number of consumers, the number of lighting consumers having increased from 150 to 228, while a number of others have signed contracts, but owing to the great demand the Town has not as yet been able to make the necessary connections. There are at the present time three power customers being supplied and two others awaiting connections.

Glencoe

The power conditions in Glencoe have been investigated, and a number of estimates have been prepared of the cost of serving them under various conditions. As yet, a satisfactory proposition has not been submitted, but with the recent developments in the power situation in other municipalities in the district and in Essex and Kent counties, it is anticipated that power can be given Glencoe at a reasonable cost.

Goderich

In November, 1912, a contract for the supply of 700 h.p. at an estimated cost of $37.00 per h.p. per year, was drawn up and submitted to the Municipality. In the following month they were also advised that $30,000.00 would be required to cover the cost of sub-station equipment, and of reconstructing their distribution systems. Plans were submitted showing the location of new street lights, and of the various power and lighting circuits to be installed. After discussing these subjects, and having the various details explained, the Council of the Town of Goderich instructed the Mayor and Clerk, to sign the contract as submitted, and to proceed with the construction.

Orders were placed for supplies at once, the Council having passed a resolution requesting the Commission to do so. Work was started in March under the supervision of this Department. This work included the reconstruction of their distribution and street lighting systems and the installation of an ornamental street lighting system in the business section. The intallations have been completed and it is anticipated that power will be delivered about the end of December.

Granton

See Report on Ailsa Craig.

Grand Valley

A resolution was received from the Village of Grand Valley asking for an estimate on the cost of transmitting 100 h.p. to them. The proposition of delivering this power is being considered along with the other towns and villages in this district.

(See Report on Alliston).

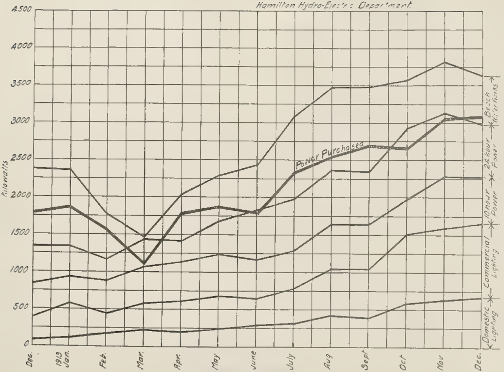
Grantham Township

A number of estimates of the cost of serving the residents of this Township with power were prepared in an endeavor to ascertain the most economical method of distribution. Representatives of the Commission addressed meetings of ratepayers of the Township where the question of rural distribution of power was dealt with. At the same time a complete survey was made of the Township to obtain all possible data in regard to the possible load and its distribution, in order that the estimates referred to might meet conditions closely.

A schedule of rates was prepared based on these estimates and a representative attended a meeting of the Township Council, submitting these estimated rates to them. The Council thereupon passed a resolution approving of those rates, and requested the Commission to assist them in canvassing the Township for contracts.

Grimsby

See Report on St. Ann's district.



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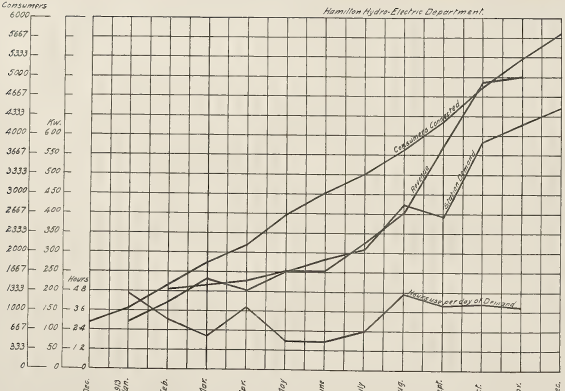
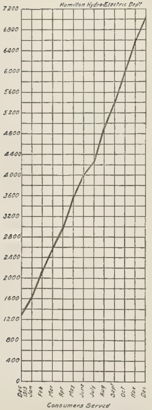


Growth of Domestic Service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Consumers Served

Grimsby, North Township

In compliance with a request from the Reeve of the Township of North Grimsby, a representative addressed a meeting of the Council, and explained to them the procedure to be followed to obtain a supply of Hydro-Electric power in rural districts.

Guelph

At the beginning of the year the Commission recommended the standard schedule of rates for use in Guelph which change made necessary a detailed study of the Guelph municipal load. With this object in view a representative visited Guelph, obtaining complete data concerning each power user. Several conferences were held with the officials of the Guelph Light and Heat Commission when the question of rates was discussed at some length. It was finally decided that the recommendation of the Commission be adopted.

A representative also made a number of visits to Guelph, to report on the power conditions of a number of manufacturers there, soliciting their load for the Guelph Municipal System.

The Guelph Light and Heat Commission asked permission to give power service to a large factory outside of the City limits. This case was investigated and the desired permission was granted.

During the year the Guelph load has shown a substantial increase, their demand being 1561.5 h.p., while in 1912 it was 1273.5 h.p.

Hagersville

The Council approved the Commission's estimates for a distribution system on November 9, 1912, and requested that construction should be started as soon as possible. This work was begun almost immediately and completed in April at a cost of about 5 per cent. less than the estimated amount, although considerably more work has been carried out than was included in the estimate.

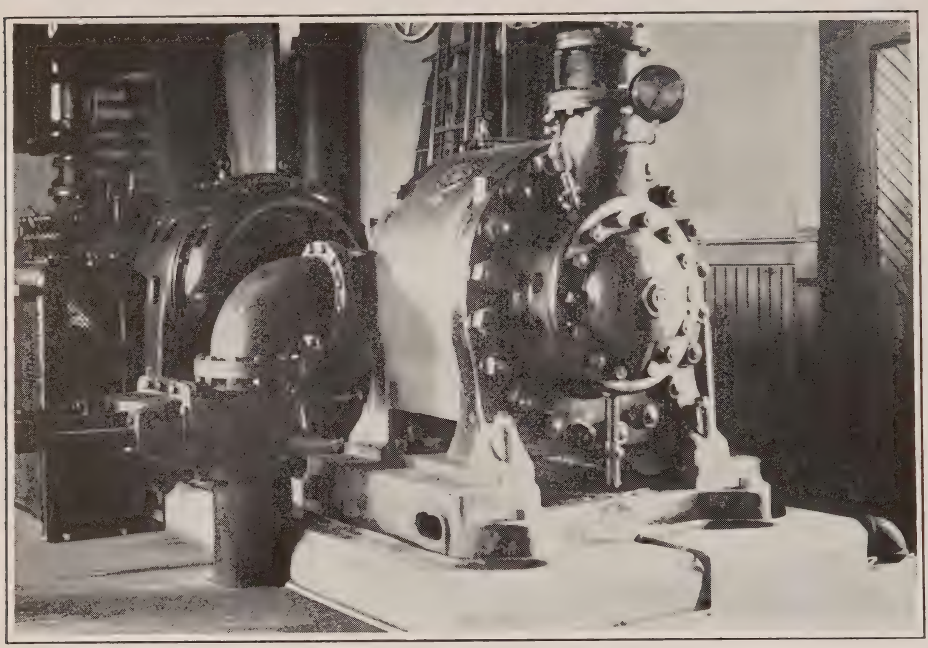
A contract between the Village and the Commission for the supply of 150 h.p. at $33.21 per h.p. per year for 2200 volt power was executed in December.

Hagersville municipal system was made alive on September 1st when power and lighting service was commenced. The Village already has considerable power load and there are prospects of further increase in the near future. Assistance is being given in working up a business in Hagersville, a representative visiting the Village at regular intervals for that purpose.

Hamilton

Although the municipal system of the City of Hamilton has been under a state of construction throughout the year, yet their business and load have both grown at a very rapid rate. The extent of this growth is illustrated by the increase in the demand on the Commission's transmission lines, the load of 2118 h.p. taken in October, 1912, having increased to 3706 h.p. for the last month covered by this report. The accompanying curves show the growth in the number of consumers, and in the loads taken by different classes of customers.

A number of conferences were held during the year, when questions arising out of the construction work that was being carried on and in reference to the management of their rapidly growing business were discussed. The schedule of rates recommended for use in Hamilton was given considerable study before being adopted.



Waterworks Pump, Galt

Lighting in Residential District, Galt

Plans for the underground system, which require the approval of the Commission before construction is commenced, were submitted for suggestions and recommendations before the complete detailed drawings were made up for submission to the Board.

West Hamilton

Inquiries having been received in regard to giving power and lighting service in West Hamilton, conditions there were investigated, and an estimate was prepared of the cost of the necessary construction. It was estimated that the total cost would be approximately $8,000.00. The Town of Dundas expressed themselves willing to undertake the management of this service, and permission was granted them to do so, it being stipulated that the rates used in billing users of light and power should be approved by the Commission. In making this installation, this Department acted in a consulting and supervising capacity.

Power and lighting service has been given in West Hamilton and arrangements are now being made to install street lights, which will complete their present system.

(See Report on Dundas).

Harrow

A representative investigated the power conditions in Harrow and reported 150 h.p. to be in use. A report was also made on the franchises held by the present Company, giving an inventory of their equipment within the Municipality, and the rates in force. The proposition of serving Harrow is being considered along with the other municipalities in Essex County.

Hawtry

See Report on South Norwich Township.

Hespeler

Although there have been no important developments in Hespeler during the year, they have maintained their past loads and indications are good for steady growth. A representative has visited the town at intervals to advise them on details of management and accounting. Improvements to their circuits and the installation of a lighting feeder regulator were recommended after a study of local conditions.

Hensall

See Report on Ailsa Craig.

Hillsdale

In February, 1913, a request was received from the Police Village of Hillsdale in reference to the procedure to be followed in obtaining a supply of Hydro power; in reply to which copies of the Rural Distribution Act of 1911 and resolution forms were forwarded, with instructions as to their use. In May a resolution was received asking for an estimate of the cost of transmitting 50 h.p. to them. An estimate was accordingly prepared, made on the assumption that Phelpston would also take 25 h.p. and Waverley 25 h.p., and early in July the rate of $46.93 was submitted. This estimated cost was for power stepped down to a voltage suitable for distribution within the Village.

Ingersoll

During the year a representative visited Ingersoll at regular intervals to advise the local authorities on various details of management and of operation of their Municipal System. A number of prospective power users were also visited and study made of their requirements, assisting the Municipality in soliciting their business.

The schedule of rates in Ingersoll differed greatly from the standard. To demonstrate the advisability of their adopting the schedule recommended, a detailed study was made of each consumer's requirements, and after several conferences with the local authorities, when the various points were discussed, it was decided that the recommended schedule be put in force.

The Ingersoll Electric Light and Power Commission requested permission to serve certain applicants for power and lighting service outside the Corporation limits. After going into each case thoroughly, it was finally decided that this permission be granted.

The load in Ingersoll has continued to show a satisfactory growth, their demand of 482 h.p. for 1912 having been increased to 563 h.p.

Jeannette

See Report on Merlin.

Jordan

See Report on St. Ann's District.

Kerrwood

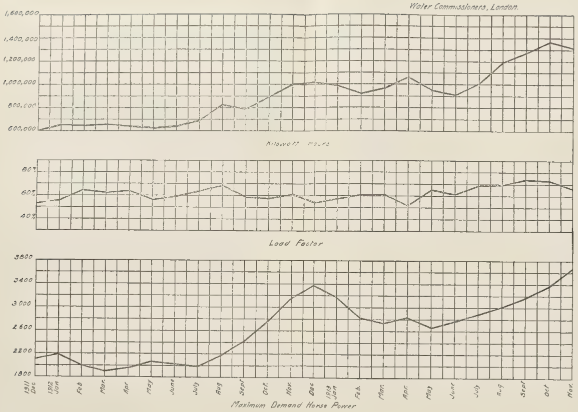
A representative visited Kerrwood to make a study of the local power conditions. He reported that 110 h.p. was in use and that with the municipality contracting for a supply of Hydro-Electric power, a probable load of 60 h.p. could be obtained for their system. Estimates of the cost of Hydro power to Kerrwood are being prepared.

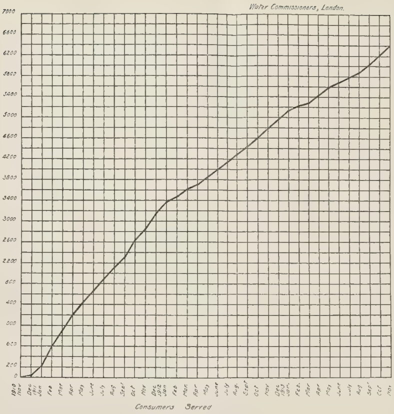
Kincardine

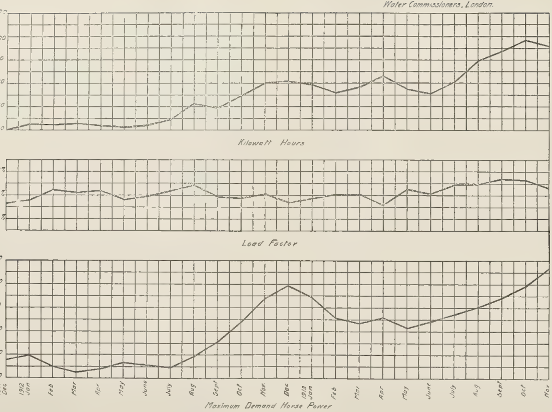
Although Kincardine passed its enabling by-law in January, 1911, no definite action can be taken on the part of the Commission to give them a supply of power, until such time as the Hydraulic Department has finished its investigations of the water powers in Bruce County. During the early part of the year a number of inquiries were received from the town as to what progress was being made towards the point when they might take up the question of a power supply. A representative visited the town about the middle of June, to address a meeting of the ratepayers and explain to them the reason for delay, and what was being done for the municipalities in that part of the Province.

Kingsville

A representative visited Kingsville and made a detailed study of the power situation there. He reported 1,350 h.p. to be in use, which amount would be increased to 1,400 h.p. in the near future. A report was also made on the franchise of the Company at present operating there, giving an inventory of their equipment within the Municipality, the rates in force, and the approximate cost of power. The proposition of serving Kingsville is being considered, together with the other towns and villages in Essex County.


Water Commissioners, London.
Kilowatt Hours
Load Factor
Maximum Demand Horse Power


Water Commissioners, London.
Consumers Served


Water Commissioners, London.
1,600,000
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80%
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Load Factor
3800
3400
3000
2600
2200
1800
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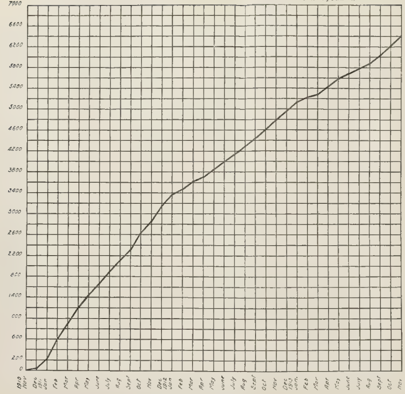
Water Commissioners, London.



Consumers Served

Kingscourt

The power conditions in Kingscourt were investigated and it was found that the total amount of power being used was very small, not totalling more than 25 h.p., and that the load which could be obtained for a Municipal Hydro-Electric system would also be very small.

Kingston

In April, 1913, an estimate was prepared of the cost of an underground distribution system for the City of Kingston, and a report that a By-law for $34,000 should be sufficient to cover this was submitted to the local authorities. This By-law was carried early in June, and the Department was immediately instructed to proceed with the preparation of plans of a conduit system together with ornamental street lights to be installed in the business section. The local authorities of the city called for tenders in accordance with the plans submitted. At their request a representative was present in Kingston when these tenders were opened, to advise them in placing the contract for the work.

An inquiry was received asking for advice and costs of installing a 6,000,000 gallon pump for the city. Estimating quotations were obtained covering the equipment desired, and were submitted.

Komoka

During March a representative visited Komoka and reported the power requirements of that village to be about 50 h.p. Estimates were accordingly prepared of the cost of serving Komoka from London, together with Strathroy and Mount Bridges. The following estimated costs were submitted in June:—

Komoka taking 100 h.p. of the total of 1,200 h.p. to the three municipalities—$29.81 per h.p. per year.

Komoka taking 50 h.p. of the total of 600 h.p. to the three municipalities—$35.22 per h.p. per year.

These estimated costs are for power delivered at a voltage suitable for distribution within the village limits.

Leamington

A representative visited Leamington making a detailed study of the power situation there. He reported that 775 h.p. was being used and that a probable load of 150 h.p. could be obtained for a Municipal Hydro-Electric System. He also made a complete report on the electric plant operating there, giving details in connection with their franchise, an inventory of their equipment, and the approximate cost of operation. The proposition of supplying power to Leamington is being considered along with the other towns and villages in Essex County.

London

During the year the London Municipal load has continued to show a satisfactory increase, their demand having reached 3,391.5 h.p., while that for 1912 was 2,681 h.p. The accompanying curves show the manner in which this load has increased during the last two years both as to demand and as to consumption. It will be noted that there has been a steady improvement in the load factor in their system. The rate at which new consumers have been taken on since the inception of the Hydro power is also shown. This curve shows a steady increase from month to month.

Louth Township

A petition asking for an estimate of the cost of power service in the Township of Louth was received in November, 1912. In response to this a representative addressed a meeting of the Township Council in January, 1913, on the question of power to rural districts. He reported the requirements of Jordan as 20 h.p. and of Jordan Station as 250 h.p. In June a representative went over the districts covered by the petition and obtained data whereby estimates could be made of the cost of giving service to the Township in the most economical manner.

Lucan

An application was received from Lucan asking for an estimate of the cost of transmitting 300 h.p. to that Municipality. The proposition of supplying this power was considered along with that of serving other towns in this district.

(See Report on Ailsa Craig.)

Lucknow

In response to a request from the Lucknow Board of Trade asking for information in reference to Hydro-Electric power, a representative attended a meeting of that body and addressed it on the subject. While there he made a study of the local power conditions, and reported that a probable load of 100 h.p. could be obtained for a Municipal Hydro-Electric System.

Markdale

A representative visited Markdale who reported that a probable load of 150 h.p. could be obtained for a municipal Hydro-Electric system.

(See report on Owen Sound).

Markham

The Village of Markham passed the enabling by-law in January, 1913, by a vote of 157 to 8. Previous to this representatives had addressed meetings of the ratepayers when the workings of the Hydro-Electric scheme were explained.

A representative also visited Markham who made an inventory of the electrical equipment at present installed in the village and made notes of conditions, from which an estimate was made of the cost of remodelling and reconstructing their system to distribute Hydro-Electric power. The village was advised that they would require $5,000.00 to cover the cost of this work.

A number of estimates were made of the cost of serving Markham together with other municipalities in that district. None of these were submitted, however, nor has any further action been taken pending the decision that is to be made in reference to running a municipal railway through that district, which would receive its supply of power over the same lines as the municipalities.

Melbourne

A representative visited Melbourne and reported that 25 h.p. was being used there, which amount would be increased to 40 h.p. in the near future. Should a contract be signed for Hydro-Electric power, a probable load of 25 h.p. could be obtained for a municipal system.

Merritton

A representative visited Merritton who made a complete report on the power situation there. He reported 5,135 h.p. of waterpower to be developed there, of which 3,895 h.p. was being used. In addition to this, 105 h.p. of electrical power was purchased, making a total of 4,000 h.p. in use in the town. This total amount was to be increased to 4,615 h.p. in the near future.

Merlin

A representative visited Merlin, to investigate the power situation there. He also investigated the situation in Fletcher, Jeannette and Coatsworth. The following amounts of power were reported to be in use in these places:—

Fletcher	25 h.p.
Jeannette	25 h.p.
Coatsworth	50 h.p.
Merlin	100 h.p.

It is not probable that the loads that could be obtained in this district would be large, but estimates of the cost of power to these villages will, however, be made up in connection with the scheme of supplying power to the municipalities in Kent County.

Midland

During the year a representative has visited Midland at regular intervals and advised the local authorities on various details of management. Assistance was also given in soliciting new power consumers and in laying out extensions to the municipal distribution system to serve them. Their business has continued to increase during the year in a satisfactory manner in all departments, new consumers being continually added to their system both for power and for lighting service, and with the prospects they have at present in hand, a further increase is expected for the next year.

The amount of power taken by Midland has increased to 315 h.p. for the last current month.

Milton

The local distribution system in Milton was reconstructed under the supervision of this Department, which work included the installation of a new street lighting system replacing their old system and arranged to light all streets, rebuilding their old power and lighting distribution systems, to adapt them to the use of Hydro-Electric Power, and building extensions to cover districts in which no service had been previously given.

Niagara power was first delivered to Milton on March 13th. During their first month of operation a load of 187.5 h.p. was taken. The load taken during the last current month was 321.5 h.p.

Assistance was given Milton in connection with the various details of management, and in soliciting prospective power consumers, a representative visiting the town at regular intervals for that purpose.

Mimico

A petition having been received from Etobicoke Township asking for electric service to certain residents living near Mimico, it was proposed to have the village take care of this load. The local Commission expressed their willingness to handle this business, and an agreement was accordingly drawn up and signed.

Materials for this line were ordered and as soon as these had arrived, construction work was started and carried on to completion under the supervision of this Department.

A representative visited Mimico at regular intervals who advised them on any questions coming up in connection with their power business, and assisted them in soliciting additional load. During the year their load has increased from 50 h.p. taken in October, 1912, to 71 h.p. for the last current month. It will be noted that Mimico contracted for 50 h.p.

Mitchell

Frequent visits were made to Mitchell during the year by a representative of the Commission, who found their electrical department in a very healthy condition, and that general satisfaction existed among the consumers. There has been no phenomenal growth in the numbers of consumers or in the power used during the year, due to the fact that during 1912, when a vigorous campaign for business was carried on, nearly all the possible consumers were given service.

Mount Brydges

A representative visited Mount Brydges addressing a meeting on the steps to be taken to obtain a supply of Hydro-Electric power. This meeting was attended by delegates from various towns and villages in that district, including Strathroy, Glencoe, Newbury, Wardsville, Melbourne, and Komoka. While there he also investigated the local power conditions and reported 30 h.p. to be in use, which amount would be increased to 65 h.p. in the near future. The probable initial load that could be obtained for a municipal Hydro-Electric system was estimated at 35 h.p. A number of estimates were made of the cost of serving Mount Brydges together with the other towns in that district, and in June the following estimated costs were submitted:

Mount Brydges taking 100 h.p. of a total of 1,200 h.p. transmitted to Strathroy, Komoka, and Mount Bhydges: $35.23 per h.p. year.

Mount Brydges taking 50 h.p. of a total of 600 h.p. transmitted to Strathroy, Komoka, and Mount Brydges: $46.08 per h.p. per year.

These estimated costs are for power delivered to Mount Brydges at a voltage suitable for distribution within the municipality.

Nelson Township

An application was received asking for an estimate of the cost of power to be distributed through the Township of Nelson. A study will be made of the local conditions in order that the estimate may be made on the most advantageous basis.

A brick company who were establishing a plant near Appleby in this township, applied to the Commission for a supply of power. Estimates were prepared of the cost of transmitting the power to them, and a proposed form of agreement was prepared which was submitted to the company for their consideration.

New Hamburg

A representative visited New Hamburg at regular intervals who advised the local authorities on any details of management concerning which they were in doubt, and assisted them in laying out extensions to serve new consumers. During the year, the New Hamburg municipal load has shown a satisfactory growth, having increased from 107 h.p. in October, 1912, to 174 h.p.

Newburg

A representative investigated the power situation at Newburg and reported 190 h.p. to be in use there, and that a probable load of 50 h.p. could be obtained for a municipal Hydro-Electric system.

Newmarket

In December, the following estimated costs of power were submitted to Newmarket:—

300 h.p.—$27.90 per h.p. per year.
500 h.p.—$25.43 per h.p. per year.

These estimated costs were for power delivered to the town at 13,200 volts. Power at 44,000 volts was, however, recommended in preference to the above, an estimated cost of $28.50 per h.p. per year on the basis of 500 h.p. being submitted.

Subsequent to this a private corporation submitted a proposition to the town for a supply of power. A by-law authorizing an agreement with the private corporation was submitted to the ratepayers and defeated. No further action has been taken on the part of the town in reference to obtaining a supply of power through the Hydro-Electric Power Commission.

Niagara Falls

In November, 1912, estimates of the cost of supplying power in amounts varying from 1,000 h.p. up to 5,000 h.p. in steps of 500 h.p. were forwarded to this municipality, the cost varying from $12.82 per h.p. per year for the smaller quantity to $11.71 per h.p. per year for the larger. These costs were made on the assumption that power will be delivered to the town at a voltage suitable for distribution along the city streets.

Niagara Township

A representative attended a meeting of the Council of the Township of Niagara when Hydro-Electric matters were explained, chiefly those in reference to the supply of power in rural districts. A petition had been received from this township which was small and not representative, and it was decided not to prepare any estimates until a thorough canvass could be made. A report made on the power situation in this township places the total power used for manufacturing purposes at 400 h.p.

North Bay

The annual reports of 1911 and 1912 give the history of the Commission's association with North Bay up to the beginning of the year just closed.

The enabling by-law was passed in December, 1912. At the same time a by-law to authorize the renewal of the Power Company's franchise was defeated.

A valuation was made of the local distribution system which was submitted to the town. Using this valuation as a basis, a by-law to raise $60,000.00 for the purchase of this system, and for making changes and additions to it was passed in January, 1913.

Since that time estimates have been made and negotiations have been carried on to obtain a supply of power for North Bay which negotiations are still pending.

Norwich, South Township

Estimates were made of the cost of serving the villages of Otterville, Hawtrey, Springford and Rockmills, in the Township of South Norwich. Advantageous propositions could not be given at this time owing to the small quantities of power required and the long distances over which they would have to be transmitted.

Norwich, North Township

A number of contracts were signed between residents of the Township of North Norwich and the township for power and lighting service, along the road running from Norwich to Newark. It was arranged that the Commission build the lines necessary to give this service, which after completion were handed over to the Village of Norwich for operation and management. These arrangements were made on the understanding that should the township wish to take over this work to form a portion of a township system at any time, the line would be transferred to them. (See report on Norwich).

Norwich

A representative visited Norwich at regular intervals to help the local officials on various details of management and of engineering, in connection with their municipal electric system. Assistance was also given in soliciting new power users. Certain residents in the Township of North Norwich near the Village of Norwich having applied to the Commission for a supply of power, lines were built to serve them. Arrangements were made whereby the Village of Norwich assumed the responsibility of the operation of these lines and handling all of the business in connection with them. (See report on North Norwich Township.)

The village having proposed installing a waterworks system, assistance is being given them in working up a scheme that will meet their needs. Various proposals submitted from other sources have been referred to the department for comment. This matter will be reported on shortly.

Oil City

A representative visited Oil City who reported 50 h.p. to be in use there and that a probable lighting load of 10 h.p. could be obtained for a municipal Hydro-Electric system. Owing to this load being very small it is not probable that a satisfactory proposition can be submitted to Oil City until a considerable load has been obtained in the Sarnia district.

Oil Springs

A representative visited Oil Springs who made a detailed study of the power situation there. He reported that 640 h.p. was in use, which amount would be increased to 680 h.p. in the near future.

Orangeville

A representative visited Orangeville to investigate the power situation there and reported that a probable load of 800 h.p. could be obtained. A request was also received from Orangeville asking for estimates of the cost of transmitting 200, 500 and 700 h.p. to them. These estimates are now in the course of preparation, being made up on the assumption that the other towns and villages in this district will also take power. (See report on Alliston).

Ottawa

The City of Ottawa's Municipal Electrical Department is progressing in a very satisfactory manner. New consumers are being taken on at a very rapid rate. This has caused such an increase in the demand for power on the Commission, that it has been deemed advisable to make arrangements for the supply of a greater quantity than that covered by the present agreements. Negotiations towards this end are at present in hand, it being proposed to obtain sufficient power for the whole of this district.

Otterville

See report on South Norwich Township.

Owen Sound

The Town of Owen Sound had proposed to raise $50,000.00 by debentures to make extensions to the municipal electric light plant, including the installation of additional generating equipment. A representative visited the town and made a study of the local power situation. His report gave a description of their plant, the conditions existing there, the approximate cost of operation and the rates used in the sale of power.

About this time the Commission had obtained an option on the Eugenia Falls development, and Owen Sound was advised of that fact, it being estimated that 1,500 h.p. could be delivered to Owen Sound from this point at a cost of $29.00 per h.p. per year, for power at a voltage suitable for distribution within their limits. A representative then attended a meeting of the town officials and explained the proposition to them. An approximate statement was prepared and forwarded the town, showing the saving that could be made over their present power costs.

After a number of conferences at which the power question was discussed in detail, and which were attended by a representative of the Commission, a request was received from the town asking for an estimate of the cost of 800 h.p. transmitted to them from Eugenia Falls. This estimate was accordingly prepared and a letter was forwarded, advising that that quantity of power could be delivered at a cost of $31.00 per h.p. per year.

An audit was made of the books of their Electric Light Department, and using the Auditor's report as a basis of cost, a second statement was prepared showing the cost of their power as generated by steam. This was found to be substantially the same as had been obtained from the approximate figures referred to above.

A form of agreement to be entered into between the town and the Commission was prepared and submitted to the town officials for their consideration. This agreement called for the delivery of 800 h.p.

The negotiations just outlined covered a period from the middle of December, 1912, to the middle of April, 1913. About the end of May a copy of a resolution adopted by the Town Council was received by the Commission, which stated that the town would enter into an agreement with the Commission for a supply of power from Eugenia Falls, provided 1,200 h.p. could be carried during low water periods. Further action in the matter has been held up until the Hydraulic Department report on flow conditions. The findings of the Hydraulic Department concerning Eugenia Falls will be found elsewhere in this report. (See Hydraulic Report).

In the meantime an investigation was made of the power requirements of the villages in this district, including Flesherton, Markdale, Chatsworth and Durham. (See reports on these villages).

Paris

An agreement for the supply of 600 h.p. to the Town of Paris at an estimated cost of $21.00 per h.p. per year for 26,400 volt power was drawn up and signed.

During the year the local authorities have been remodelling their distribution system, adapting it to handle the power to be supplied by the Commission. Their street lighting system was entirely remodelled, new brackets and 100 c.p. lamps being placed in all portions of the town. An ornamental street lighting system was planned for the business section and will be installed next year.

Specifications were drawn up and transforming and switching equipment ordered to be installed in the town's power station. The old steam station is being remodelled for this purpose from plans prepared by this Department.

In anticipation of power being delivered to Paris at an early date, a schedule of rates recommended for their use was drawn up and submitted to them. A representative has visited Paris a number of times for the purpose of explaining the system of charge and assisting them in laying these rates before prospective power users.

Parkhill

See Report on Ailsa Craig.

Palmerston

In compliance with a request from Palmerston, a representative reported on their electric lighting plant. This report covered in detail the equipment and method of operation of their generating equipment, the rates in use, and the financial condition of their utility. The Town was advised wherein they could make a saving in their cost of operation and of management, instructions being given as to the procedure to be followed in each separate detail.

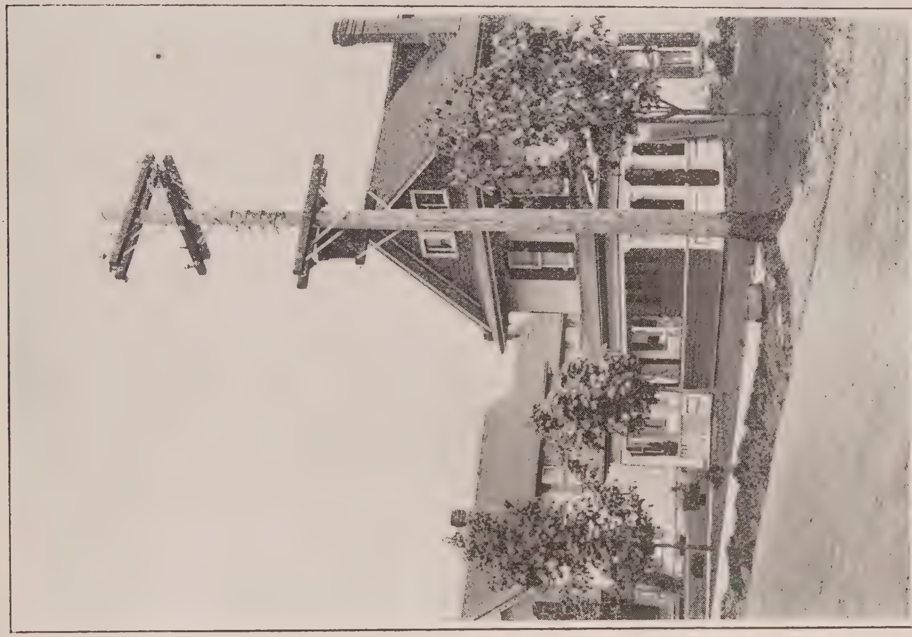
Penetanguishene

During the year a representative visited Pentanguishene at regular intervals who advised the local officials in the various details of management and of operation of their municipal system. Assistance was also given them in soliciting new power consumers and in laying out extensions to serve them after contracts had been signed.

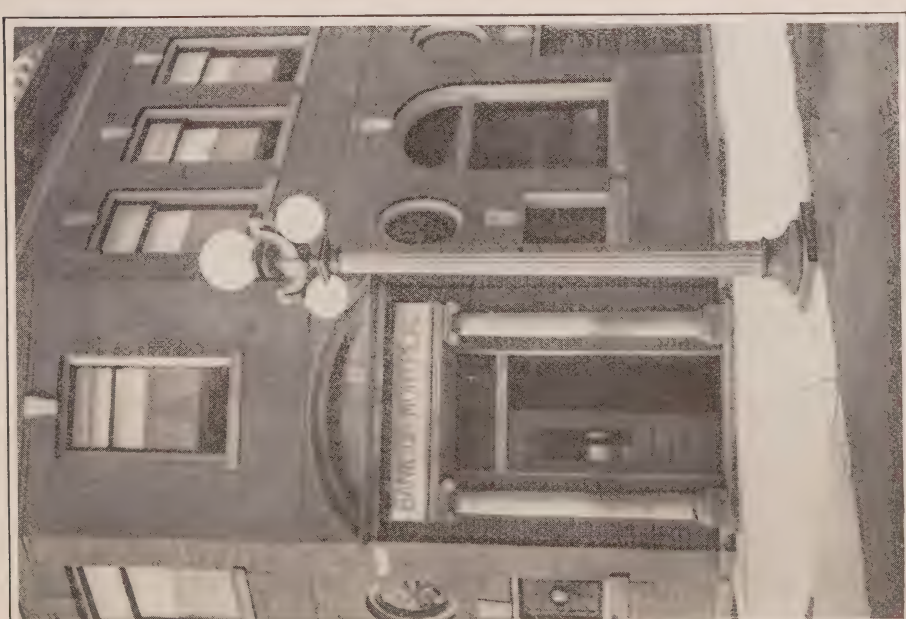
The load taken by the town has increased to 284 h.p. and with the addition of the load to be taken by motors that are at present being installed, it is anticipated that a demand of about 600 h.p. will be reached. One of their consumers is considering the advisability of making extensions that will require an additional motor installation of 1,200 h.p. Should this proposition materialize, Penetanguishene will have a load greatly exceeding their anticipations. In this connection it is of interest to note that their contract calls for the delivery of 200 h.p.

Peterboro

A by-law to authorize an issue of debentures for $120,000.00 to acquire a distribution and street lighting system was carried in January. Representatives had addressed a number of ratepayers' meetings in the interest of this by-law and of the Hydro-Electric scheme, assisting the local authorities in placing this question before the people.



Georgetown, Typical Wiring Arrangement



Street Lighting Standard. Goderich

A contract for the supply of power to the City of Peterboro was then drawn up and submitted to the City for their consideration. After discussing the proposed agreement with them and arranging all details to the mutual satisfaction of the City and Commission, the contract was signed.

Acting in the capacity of Consulting Engineer for the City of Peterboro, plans were prepared of an underground system of street lighting distribution to supply magnetite arc lamps placed on ornamental poles. Tenders were received covering all the materials required which were submitted to the local authorities, with recommendations. Contracts were subsequently let for this equipment, and the work of construction is being carried on under the Department's supervision.

With the installation of their ornamental street lighting, the question of having all wooden poles removed from the streets in that section was taken up. It was arranged to carry the lines giving lighting service on poles located in the alleys and at the backs of lots. With this arrangement and with the removal of a small number of poles belonging to telegraph and telephone companies, these streets will be cleared of all poles except those used to carry the street lighting brackets.

A valuation was made of the plant and equipment of a local company, a report on which was made out in detail, and forwarded to the local authorities to be used by them in arbitration proceedings regarding the purchase of the Company's property.

Pelham Township

Power conditions were investigated in this district early in the year by a representative of the Commission, who reported that there was considerable interest in the question of obtaining Hydro-Electric power. At the request of the Township another representative addressed a meeting of ratepayers, instructing them as to the procedure to be followed to obtain such service. No further action has been taken on the part of the Commission, as the necessary rural petitions have not as yet been received. (See report on Fonthill.)

Petrolea

A representative visited Petrolea who made a study of the local power situation, on which he reported in detail. It was found that 1,195 h.p. was being used for various purposes, which quantity was expected to increase to 1,915 h.p. in the near future. In the event of the Town contracting for a supply of power, a probable load of 500 h.p. could be obtained for a Municipal Hydro-Electric System. The proposition of serving Petrolea with Hydro-Electric power is being considered along with other municipalities in this district.

Petersburg

Applications having been received for power and lighting service in Petersburg and also from St. Agatha, estimates were prepared of the cost of transmitting the power to these points from Baden. It was shown that with existing demands the power could be transmitted economically. A line was accordingly built from Baden, it having been arranged that the Commission would finance the construction, while Baden would assume responsibility of the operation of the line and collect all revenues for service. (See report on Baden.)

Plattsville

See Report on Blenheim Township.

Port Arthur

In the report of 1912, it was recorded that the Commission had taken up the work of assisting Port Arthur in remodelling the equipment in the Current River plant to take care of prospective increase in their load. A representative had visited Port Arthur for that purpose, who reported in detail the changes and additions that would be needed in their generating plant and transmission system. Data was also obtained as to the additional load they contemplated serving. With this data at hand, plans were drawn up covering the changes to be made to their local system concerning which Port Arthur has been advised in detail. The desirability of having this work done at once has been explained to the local authorities.

Estimates were prepared of the cost of serving the proposed new consumers in Port Arthur, among which were the Dominion Grain Commission's new grain elevator, Port Arthur Elevator Co. (C.N.R.) and the C.N.R. coal docks. Forms of agreement between the City of Port Arthur and the Dominion Grain Commission and also between the City of Port Arthur and the Port Arthur Elevator Co., were drawn up, covering the supply of power at 22,000 volts at a rate based on the estimates that had been prepared. These agreements were signed, the Dominion Grain Commission contracting for 1,000 h.p. and the Port Arthur Elevator Co. for 400 h.p.

In addition to assisting Port Arthur in laying out extensions to serve these new consumers, the Department also acted in a consulting capacity for the consumers, assisting them in purchasing their electrical equipment. Plans of the electrical layout of these plants were also examined, and comments and recommendations were made before the final arrangment was decided upon. After the completion of the installation an inspection was made of the electrical equipment. As a result of this work the new Dominion Grain Elevator was completed and placed in operation late in September, and is operated entirely by power supplied by the city. It is expected that the economies here shown will result in further loads from grain elevators and point to a large additional load of this character adjoining the Government elevator.

It having been decided to erect a new pumping station in connection with the Municipal Water Works System, considerable preliminary work has been done in connection with the necessary electrical equipment. Quotations are being received, covering this electrical apparatus, and as soon as a study has been made of these, recommendations will be made to the local authorities.

The local authorities were also advised concerning various details of management of their distribution system, and a complete inspection was made of their lines, and recommendations were made covering these points.

By operating their Current River generating station with care and economy, the purchased power has not shown a great increase resulting in a low cost of power for the city.

Port Colborne

A representative visited Port Colborne in March who made a study of the local situation. It was reported that 4,305 h.p. was being used there, which amount would probably be increased to 6,415 h.p. in the near future. If the Town should contract with the Commission for a supply of power, a probable initial load of 205 h.p. could be obtained for a municipal system.

Inquiries were made as to the procedure to be followed by the Municipality to get a supply of power. Instructions were given, and in September a resolution was received asking for an estimate of the cost of 100 h.p. to them. This estimate is now in the course of preparation.

Port Credit

A representative visited Port Credit at regular intervals who advised the local authorities on any details of management concerning which they were in any way in doubt. Assistance was also given in laying out extensions to their local distribution system. (See also report on Toronto Township.)

Port Dalhousie

Port Dalhousie has been visited at intervals by a representative who has advised them on any details of management or operation whenever they needed assistance. They were also assisted in laying out changes and extensions to be made to the local distribution and street lighting systems.

Port McNicoll

See Report on Tay Township.

Port Perry

Estimates were prepared of the cost of power to Port Perry, which under the present conditions were found to be too high. No further action has been taken pending developments in the municipal railway scheme covering that district.

Port Robinson

An inquiry was received from a manufacturing company for a supply of power to their factory at Port Robinson. Estimates were prepared of the cost of supplying this power and a contract was drawn up and signed for a supply of 110 h.p. at 12,000 volts. Arrangements were made to tap the Ontario Power Company's lines near this plant so that service could be given them with the minimum amount of construction, and an agreement was drawn up and signed covering this detail. Arrangements were made with the Town of Welland that they take care of the service as well as any other service that might be required in the village. (See report on Welland.)

Port Stanley

During the year a representative visited Port Stanley at regular intervals to advise the local authorities on any details in connection with their electrical department on which they required assistance. The results obtained in Port Stanley continue to be most satisfactory.

Point Edward

After visiting Point Edward and investigating the local power situation, a representative reported the total amount of power to be in use there at 215 h.p. Should a contract be signed for supply of power through the Commission, a probable initial load of 50 h.p. could be obtained for their municipal system.

Prescott

The work of reconstructing the local distribution and street lighting systems in the Town of Prescott is in progress under the direction of the Department, it being decided to replace the poles that carried primary wires and reset those carrying secondary lines. Prescott enjoys the distinction of being the first town to receive power through the Commission from developments upon the St. Lawrence River.

Preston

The load on the Preston Municipal system has continued to show a substantial increase during the year, the load of 657.5 h.p. taken during October, 1912, having grown to 931 h.p. for the last current month.

On account of this increase additions were made to the installation in the town sub-station, doubling their transformer capacity. Changes and additions were also made to the switching equipment and station wiring to permit a 6,600 volt line being carried out to serve the Doon Twines, Limited, at Doon, with whom the Commission had obtained a contract for the supply of power. Plans and specifications were drawn up covering this work, and after tenders had been received they were forwarded to Preston with comments and recommendations. The work of installation has been completed and the equipment put in service. Tenders have also been secured and orders placed for additional feeder equipment for this station.

The Preston Light and Water Commission advised the Commission that they were desirous of taking over and operating the line that the Commission had built to serve Doon. An Agreement was drawn up and signed whereby the Corporation assumes that responsibility. (See report on Doon).

Permission was asked by the town to serve certain districts outside their limits. A study was made of each particular case, with the result that the desired permission was granted.

In recommending a new schedule of rates for use in Preston, some doubt was raised as to the effect this would have on the bills of the various users. To make a thorough study of the case, a representative made a detailed report on conditions to be met with, with each consumer. Using this data as a basis of making a comparison, it was demonstrated to the local officials that satisfactory results would be obtained. The rates suggested were accordingly adopted.

The results obtained in Preston have been highly satisfactory in every way, and it is anticipated that the coming year will see a further increase in both their load and their business.

Renfrew

Owing to the fact that the contract between the Town of Renfrew and the Renfrew Power Company for street lighting will expire on June 1st, 1914, the Commission was requested to recommend and design a new and more up-to-date street lighting system for them. A representative visited the Town for the purpose of obtaining data on which to base estimates. A complete inventory was also made of the equipment of the local Companies and, based on these inventories, valuations have been made of their plants. The local manufacturers were also visited in order that that power situation could be reported on.

Reports covering all details are at present in the course of preparation, together with estimates of costs. When these have been completed, they will be forwarded to the Town authorities.

Ridgeville

See Report on St. Ann's District.

Ridgetown

After visiting Ridgetown and making a study of the power situation there, a representative made a report on the Municipal Electric Light Plant as well as the power used by the different manufacturers. He advised that 440 h.p. was being used, which quantity would in all probability be increased to 480 h.p. in the near future. Should the Municipality contract with the Commission for a supply of power, a probable load of 125 h.p. could be obtained. An estimate has been prepared of the cost of transmitting this power from the Commission's transformer station at Chatham, which estimate will be forwarded to the Municipality in the near future.

Rockmills

See Report on South Norwich Township.

Rockwood

On January 20th, 1913, the Police Village of Rockwood passed a By-law which empowered the Village Trustees to enter into a contract with the Commission for a supply of electric power and also a By-law to raise the money necessary to construct a distributing system. Three days later a contract was signed for the delivery of 50 h.p. at an estimated cost of $38.00 per h.p. per year, the power to be at a voltage suitable for distribution within the Village.

The Commission was asked to act in the capacity of Consulting Engineers to supervise the construction of their local distribution and street lighting systems. Acting in this capacity, plans were drawn up covering the work and orders were placed for materials. As soon as these had arrived a construction gang was placed in the Village who installed their system without delay.

Power was first delivered to Rockwood on August first. Since then they have been busy taking on consumers both of light and of power, and it is anticipated that their contracted amount of power will be taken very shortly.

In addition to supervising the installation at Rockwood, assistance has also been given in the various details of management, a representative having visited the local authorities at regular intervals to advise them on any questions as they came up. They were also assisted in soliciting their power consumers in an endeavor to build up a load as quickly as possible.

Russell

Preparatory to submitting the Enabling and Money By-laws, representatives of the Commission addressed rate-payers' meetings in the interest of Hydro-Electric power. These by-laws were both passed in May, the latter being for $7,000.00 as suggested by the Commission, after having prepared an estimate of the cost of installing a municipal distribution system. Estimates were prepared of the cost of delivering power to Russell and a form of agreement based on these has been prepared. This agreement calls for the delivery of 300 h.p. at an estimated cost of $33.87 per h.p. per year, the power to be at a voltage suitable for distribution throughout the Village.

Saltfleet Township

A meeting of the rate-payers of the Township of Saltfleet, held at Stoney Creek, was addressed by a representative of the Commission. At this meeting the question of supplying power in rural districts was discussed, and instructions were given as to the procedure to be followed to obtain a supply.

Sarnia

A representative visited Sarnia and made a detailed study of the power situation there. This report covered the plant and distribution system of the local Electric Company, giving a detailed description of all the apparatus used, the rates then in use for power and lighting service and the load carried. Details of the power generating equipment of the various manufacturers and other companies were also given. It was learned that 5330 h.p. was at that time being used in Sarnia, not including the G.T.R. tunnel load, and that it was proposed to increase this amount to 6570 h.p. in the near future. A meeting of the Associated Boards of Trade of Lambton County was addressed on the question of Hydro-Electric power.

Seaforth

The town distribution system is being maintained in excellent condition, while other parts of their utility are being taken care of in an equally satisfactory manner and with the assistance of this Department.

An extension was built to their local distribution system to serve Egmondville, giving house lighting and power service. Permission to do this work had been granted by the Commission some time previously. A number of small power users have been added to their lists as well as a great any lighting customers.

A proposal to instal electric fire pumps in the Town of Seaforth is now being considered.

Silverdale

See Report on St. Ann's District.

Simcoe

A number of estimates were prepared on the cost of serving Simcoe from the Brant station. Although an attractive rate was given, local conditions and a cheap supply of Natural Gas has delayed a decision. It is anticipated that with the completion of certain proposed developments in this district, Simcoe can then be given cheap power.

Smithville

See Report on St. Ann's District.

Stayner

The enabling by-law and a money by-law to raise $9,000 for Hydro-Electric purposes in the Town of Stayner were both carried at the January 1913 elections. In submitting these by-laws to the people, representatives of the Commission gave assistance to the local authorities, in addressing ratepayers' meetings and explaining the Hydro-Electric situation.

A form of contract was then drawn up covering the delivery of 125 h.p. to the town at an estimated cost of $37.82 per h.p. per year. This agreement was signed in February.

Immediately after the signing of this agreement, orders were placed for the municipal transformer station equipment and line materials necessary to extend the Simcoe transmission system to the station site, and to reconstruct the municipal distribution and street lighting systems. As soon as the materials had arrived construction work was started under the supervision of this Commission. The town having taken over the privately owned electric light plant, its street equipment was overhauled and remodeled to adapt it for use with Hydro-Electric power. Sixteen additional street lights were also installed in the business section. All construction work was completed and power service to Stayner was commenced during the last week of September.

Assistancc is being given the town officials in soliciting power consumers, as a result of which a power load of 50 h.p. has been secured so far. Advice and instructions were also given concerning the various details of management and operation, a representative visiting the town at regular intervals for that purpose.

Stoney Point

The power conditions at Stoney Point were investigated by a representative of the Commission, who reported a probable load of only 10 h.p. for a Municipal Hydro-Electric System, owing to lack of industries and population.

Stouffville

Assistance was given the local authorities in submitting the enabling By-law to the people, representatives having addressed rate-payers' meetings for that purpose. This By-law was carried by a large majority at the January elections.

A valuation was made of the distribution system of the local Company, and an estimate was prepared of the cost of remodelling and reconstructing it for use with Hydro-Electric power. The Town was advised that approximately $11,400.00 would be necessary to take care of this work.

A number of estimates were prepared of the cost of delivering power to Stouffville. None of these have been submitted, pending the action to be taken on the proposed municipal railway through that district, which, if constructed, will make possible a much better proposition than can be given with the present demand.

Stratford

This City has been visited at intervals and advice given the local officials on questions of management, operation and laying out extensions to their Municipal System. A few of the more important details taken care of are outlined in the following.

The power load had increased to such an extent that it was found advisable to add another power circuit to their system, to be controlled by a separate panel in their substation. This addition was made in accordance with the recommendations of this Department.

The standard schedule of rates recommended for use in Stratford being on a different basis from previous rates, a thorough study was made of each customer's conditions to learn the effect that the proposed change would have on their bills. After going into the question carefully with the local authorities, they finally adopted the new schedule as recommended.

The property owners living at Sebringville having made application to the Commission for a supply of power under the Rural Distribution Act of 1911, Stratford Light and Heat Commission requested permission to extend their system

to take care of this load. This permission was granted on condition that, should the township wish at any future time to take over the city's extension as part of a township system, they could do so. This line has been constructed and service is now being given in Sebringville and along the road between Sebringville and Stratford.

The growth of the load on the Stratford Municipal System has been quite satisfactory, having increased from 643.5 h.p. taken in October, 1912, to 791 h.p. for the last current month.

Strathroy

A resolution was received from the Town Council of Strathroy asking for an estimate of the cost to deliver 200 h.p. to the Municipality. About the same time an investigation was being made of the power requirements of the district west of London as far as Windsor. Strathroy was visited during this investigation and it was reported that about 980 h.p. was being used in that Town. Of this amount about 375 h.p. could be secured at the start with a supply of Hydro power. A number of estimates were prepared of the cost of serving Strathroy, of which the following were submitted, it being assumed that Komoka and Mount Brydges would also be supplied:—

Strathroy taking 1000 h.p. of the total of 1200 h.p. to the three Municipalities:—
$32.18 per h.p. per year.

Strathroy taking 500 h.p. of the total of 600 h.p. to the three Municipalities:—
$40.86 per h.p. per year.

These estimates are for power delivered to the Municipality at a voltage suitable for distribution within their limits.

Streetsville

In compliance with a request from the Village of Streetsville, an estimate was prepared of the cost of transmitting 500 h.p. to that municipality. They were advised that this quantity of power could be delivered at an estimated cost of $22.00 per h.p. per year for 13,200 volt power. Later a request having been received to revise this estimate to cover 200 h.p., a cost of $26.00 per h.p. per year for 2,200 volt power was given the municipality.

Two brick manufacturers located at Streetsville approached the Commission for an immediate supply of power to their plants. Contracts were drawn up and signed covering this service. Transmission lines and a transformer station have been constructed under the supervision of this Department and 550 volt power was delivered to these companies about the middle of October. It is expected that the Village of Streetsville will pass the necessary by-laws, to permit their taking over these contracts and lines in the near future.

St. Agatha

See Reports on Petersburg and Baden.

St. Ann

See Report on St. Ann's District.

St. Ann's District

Early in the winter a representative visited all the towns and villages in the district lying between Grimsby and Welland, and reported on the power requirements of each place. This report covered the following places, the estimated amount of power required by each being set opposite its name:—

Municipality.	Estimated H.P. Requirements.
Fonthill	20 h.p.
Ridgeville	50 h.p.
Fenwick	20 h.p.
Dunnville	150 h.p.
Grimsby	300 h.p.
Beamsville	150 h.p.
Camden	20 h.p.
Vineland	150 h.p.
Jordan	200 h.p.
Wellandport	330 h.p.
St. Ann	35 h.p.
Smithville	150 h.p.
Bismark	20 h.p.
Silverdale	20 h.p.

With these quantities of power as a basis, preliminary estimates were prepared to cover the whole district.

St. Catharines

A resolution was received from St. Catharines asking for an estimate on the cost of delivering 2000 h.p. A study was made of the proposition and at a Council meeting held late in January, 1913, a representative addressed the City officials on the Hydro-Electric question, quoting them estimated costs of $14.00 per h.p. per year for 2000 h.p. and $16.00 per h.p. per year for 1000 h.p. These estimated costs were made on the basis of the power being delivered at 12,000 volts.

A survey of water and electric power being used in the city disclosed total water power available as 2800 h.p., of which 2305 h.p. was being used. Electric power was being supplied up to 3825 h.p., making a total of 6130 h.p. in use from various sources. A Municipal Hydro system could secure a probable initial load of 450 h.p.

A manufacturing Company in looking for a site to establish a factory calling for a large quantity of power, approached the City officials on this question. They, in turn, took up the question of having the Company served by the Commission until such time as the City would be able to take care of this load. A form of agreement to cover this service was prepared and submitted to the Company for their approval. The agreement has not yet been signed.

At the request of the City, inventories were made of the plants and equipments of the local distributing companies, and other data was obtained, from which an estimate has been made of the cost of installing a Municipal System to cover the district already served. It was estimated that such a plant would cost approximately $90,000.00. The cost of installing an underground distribution system with ornamental street lights in the business section was estimated as approximately $26,000.00. These figures were submitted to the City Council for their use in preparing a money by-law to cover the cost of a Municipal Hydro-Electric System.

Old System of Street Lighting, Peterboro

New Magnetite Street Lighting, Peterboro

The enabling By-law and a money By-law authorizing an issue of debentures of $116,000.00 were carried by large majorities on October 30th. On the same day a by-law to authorize the extension of the franchise of the company operating in St. Catharines was defeated.

St. Mary's

The usual supervision and assistance was given St. Mary's at regular intervals. Some of the more important questions that were dealt with are outlined in the following.

The standard schedule of rates recommended for use in St. Mary's differing from that then in use, an investigation of conditions was made to ascertain the effect of the change in rates. After going into the matter carefully and discussing the situation with the local Commission, it was finally decided that the rates be adopted as recommended.

Recommendations and plans were made for remodeling parts of the distribution system for improving the service to customers. Estimates were submitted covering this work.

A marked improvement is to be noted in regard to the results being obtained in St. Mary's. A number of consumers of both light and power have been added to their lists. The magnitude of this increase is illustrated in the growth of their municipal load, which has been increased from 261 h.p., the maximum load taken in 1912, to 388 h.p. for the present year. The St. Mary's Cement Company who are also taking power from the Commission, have created a demand of 1,555 h.p. from which St. Mary's benefits.

St. Thomas

Requests were received from the St. Thomas Light, Heat and Power Committee asking permission to serve certain districts lying outside the corporation limits. After investigating each case the desired permission was granted, it being stipulated that service should be given at rates to be approved of by the Commission.

A number of prospective power users were interviewed on behalf of the local authorities, soliciting additional power load for the municipal system. This has resulted in a number of additional users being obtained, some of them for large blocks of power. In addition to rendering assistance in obtaining new contracts, the engineering necessary to serve these consumers was taken care of by the Commission.

The extraordinary growth of the power business in St. Thomas is shown by the manner in which the load on their municipal system has increased. During the month of October, 1912, their maximum demand was 470 h.p. For the last current month the load has reached 1,173 h.p. With the addition of the load to be taken by motors at present being installed, it is anticipated that St. Thomas will shortly have a maximum demand greatly exceeding the amount of their original contract, which covers 1,500 h.p.

To meet this increased load and also to be in a position to take care of the present prospects, it has been deemed advisable to increase their transformer installation and install extra feeders, as well as a voltage regulator in the lighting circuits. This question is at present being taken care of, and it is anticipated that this additional equipment will be ordered immediately.

A representative has visited St. Thomas at regular intervals, and in addition to taking care of the work outlined above, had advised the local officials on questions of management and operation.

The load in the southern part of the city has increased to such an extent, that it has become necessary to erect a small transformer station here, stepping down from 13,200 to 2,300 volts. With this arrangement, service can be given much more economically in this section than by transmitting the power at 2,300 volts from their main transformer station.

Springford

See Report on South Norwich Township.

Sunderland

The enabling By-law was passed in November by a vote of 83 to 1. Before submitting this By-law to the rate-payers, a representative addressed meetings on behalf of the local authorities and discussed Hydro-Electric matters.

A contract for the supply of 80 h.p. to the Village was drawn up and submitted to the Village Trustees. After a representative had explained the various terms and conditions to them, the agreement was signed.

A money by-law was carried in May by a vote of 63 to 4 to provide a local distribution system based on estimates from the Commission.

An estimate was made of the cost of acquiring a municipal distribution system for the Village of Sunderland, which was submitted for use in preparing a money by-law to cover their construction. This by-law carried in May by a vote of 63 to 4.

Sunderland will receive their supply of power from the development of Wasdells Falls.

Tavistock

Revised estimates were prepared of the cost of delivering power to Tavistock in accordance with the 1913 loads. It was found that due to the increased load on the Niagara system 300 h.p. could be delivered to Tavistock at an estimated cost of $37.00 per h.p. per year for power delivered at a voltage suitable for distribution within the municipality. This proposition was submitted to the local authorities. A further estimated cost of $39.50 per h.p. per year for 265 h.p. delivered under the same conditions was submitted. Much correspondence has passed in regard to the question of power to Tavistock and a representative of the Commission has visited the village a number of times to discuss this matter, but as yet no definite steps have been taken by the municipality.

Terra Cotta

In response to requests from brick manufacturers asking the cost of power delivered to their plants near Terra Cotta, a number of estimates were prepared of the cost of giving this service, the results of which have been submitted.

Thamesville

After making a study of the power in Thamesville, a representative reported 200 h.p. to be in use in that municipality, which quantity would probably be increased to 220 h.p. in the near future. In the event of the town contracting with the Commission for a supply of power, a probable initial load of 100 h.p. could be

obtained from a municipal Hydro-Electric system. Estimates of the cost of transmitting this power to Thamesville from the Kent transformer station have been prepared, and will be submitted to the local authorities in the near future.

Thamesford

A representative visited Thamesford and obtained data from which to place orders for materials for their municipal distribution system. These orders have been placed, at the request of the village, and as soon as materials arrive, construction work will be started. It is anticipated that everything will be in readiness to receive power by the time the line, at present under construction from London, is completed.

Thedford

See report on Ailsa Craig.

Thorold

A request was received from a manufacturer, asking for prices on 1,000 and 2,000 h.p, delivered to his plant near Thorold. The Town of Thorold also requested estimates on the cost of delivering 500 to 2,000 h.p. to them. Estimates were prepared and a cost of $14.00 per h.p. per year was submitted this rate to apply for any quantity over 500 h.p. provided 10,000 h.p. were taken in that district.

A survey was made of the power situation in this district and it was reported that with the municipality contracting with the Commission for a supply of power a probable initial lighting load of 100 h.p. could be obtained.

Tilbury

After investigating the power situation in Tilbury, a representative of the Commission reported that 690 h.p. was being used there, which amount would probably be increased to 840 h.p. in the near future. Should a contract be entered into with the Commission for a supply of power, a probable initial load of 250 h.p. could be obtained for a municipal system. Estimates have been prepared of the cost of transmitting this power to Tilbury from the Kent transformer station, and will be submitted to the municipality in the near future.

Tillsonburg

The results obtained from the co-operation of this Department with the Municipality on questions of operation, construction and soliciting new business has resulted very satisfactorily.

In recommending a schedule of rates for use in Tillsonburg after the standard form, a study was made of local conditions to ascertain the effects the suggested change would have. After going into the question at some length, the schedule was adopted as recommended.

A large number of lighting and power consumers have been added to the municipal system, and it is anticipated that more will come on in the immediate future. During the year their load has increased from 188 h.p. taken during October, 1912, to 208 h.p. taken during the last current month.

New Toronto

Acting on a resolution from the Council of the Village of New Toronto, an estimate was prepared of the cost of installing a local distribution system within their limits. They were advised that $6,272.00 would be required to

cover this work. An estimate was made of delivering 50 h.p. to the village, and an agreement covering that amount at an estimated cost of $28.00 per h.p. per year and at a voltage suitable for distribution through their streets was also submitted.

The enabling by-law was passed in June, and a money by-law in July, the latter authorizing the issuing of $8,000.00 of debentures. Both by-laws were carried by large majorities.

The power agreement was signed in July, and orders were immediately placed for the materials necessary for the construction of their local distribution system. Construction work is now going on under the supervision of the Department. Portions of this system have been completed, and were put into service during the last month covered by this report. The whole village will be getting service in the course of a very few weeks.

Toronto

During 1912, arrangements were made with the Toronto Electric Commissioners whereby they were to take care of the service to certain districts in York Township, located close to the city limits. A number of similar districts requested service of the Commission during the current year. Upon the receipt of each request, a study was made of the requirements of the district referred to, to ascertain the feasibility of giving the service. Wherever it appeared evident that revenues would be forthcoming to warrant the expense of making the construction, the Toronto Electric Commissioners were instructed to proceed with the work under the same conditions as had been arranged for the districts already served.

The question of fixing a rate for power to the City waterworks was referred to the Commission. A thorough investigation was made of the cost of pumping water, as well as the cost of supplying electrical power for this purpose. After considering all details carefully, a rate was finally arrived at which has been submitted and approved.

The growth of the load on the Toronto Hydro-Electric System has exceeded all expectations. The maximum load taken during 1912 was 13,037 h.p. while during the present year a demand of 17,997 h.p. was made.

Toronto Township

Toronto Township enjoys the distinction of being the first township to enter into a contract with the Commission for a supply of power.

Early in the year, a number of contracts were made for rural service in the southern part of the township, near Port Credit and Cooksville. It was arranged that the Village of Port Credit should assume the management and operation of the lines built by the Commission to serve these applicants. The number of consumers served by these rural lines began to rapidly increase, and a number of extensions and additional lines were required. This state of affairs began to develop early in the summer, and the township council, having become aware that a large rural system was being built up, proceeded to take steps to take over the operation and management of this system for themselves. An agreement was accordingly drawn up and signed covering the supply of power to the township.

The township system as already constructed consists of tthe following lines:—

Along the Lake Shore Road from Port Credit to the Toronto Golf Club, then north about one mile.

Along the Lake Shore Road from Port Credit to Clarksons, with a branch from Clarksons about one mile long.

Along the Centre Road from Port Credit, north about one mile.

Along the Centre Road from the Commission's Cooksville transformer station, north to Dundas Street, then east along Dundas Street through Cooksville Village and as far as the C.P.R. crossing.

Along the Gravel Road from Port Credit to the Mississaga Golf Club.

All of these lines have been constructed for the township and placed in operation, and further extensions are to be constructed immediately.

Tottenham

See report on Alliston.

Uxbridge

The enabling by-law was submitted at the January elections and carried by a large majority. Prior to this representatives visited Uxbridge and assisted the local authorities in bringing the Hydro-Electric question before the people, addressing a number of public meetings in the interest of the cause. A number of estimates were prepared of the cost of serving Uxbridge along with other municipalities in that district. None of these have been submitted, pending the action to be taken on the municipal railway scheme which will greatly reduce the cost of the supply to the municipality if it is carried out.

Vineland

See Report on St. Ann's District.

Wallaceburg

The power situation in Wallaceburg was investigated by a representative who reported that, should the municipality contract with the Commission for a supply of power, a probable initial load of 225 h.p. could be obtained for a municipal Hydro-Electric system. Should certain large users of gas engines become customers, a demand of about 2,700 h.p. would result.

Walkerville

In investigating the power conditions in Windsor, Walkerville was also visited, and a complete report prepared on the situation there. It was learned that 2,263 h.p. was being used in Walkerville and Ford City, which amount was expected to increase to about 3,000 h.p. in the near future. With the municipality contracting with the Commission for a supply of power a probable load of 1,500 h.p. could be obtained for their municipal system.

At the request of the town an estimate was prepared of the cost of installing a power and lighting distribution system within their limits. A study was made of their local conditions, and an estimated cost of $58,259.00 was submitted. This estimate included the cost of street lighting, house lighting and power distribution systems covering the whole town, but did not include the cost of underground work in the business section.

A form of contract covering the delivery of 1,500 h.p. to Walkerville at an estimated cost of $38.00 per h.p. per year was drawn up and submitted. A representative has also visited Walkerville and discussed with the local authorities the proposed contract, their proposed money by-law and other questions pertaining to Hydro-Electrical power.

Wardsville

The power situation in Wardsville was investigated by a representative who reported 15 h.p. to be in use there, which amount it was proposed to increase to 35 h.p. in the near future. With the village contracting with the Commission for a supply of power a lighting load of approximately 25 h.p. could be obtained for their municipal system.

Waterdown

A request was received from the village asking permission to serve certain residents outside of the village limits. After investigating the proposition, permission was granted, the rates charged for service to be approved by the Commission.

At regular intervals during the year, a representative has visited the village, and advised the local authorities on questions of operation and construction. It was shown wherein a saving could be made in a number of details, and instructions were given to this end. Waterdown has continued to carry a load on their system of 40 h.p. In addition to this load the Dominion Sewer Pipe Company, who take power directly from the Commission near Waterdown, have increased their demand to 248 h.p. Waterdown benefits thereby.

Waterford

The enabling by-law was submitted to the ratepayers at the January, 1913, elections and carried. An estimated cost of $33.00 per h.p. per year had been submitted, this estimate having been made on the asumption that Simcoe would also take power which would be supplied from the Brant station. A representative visited Waterford and investigated the power possibilities. With the small amount of power in sight and the necessity of interesting other municipalities no further action has been taken.

Watford

A representative having investigated the power situation in Watford, reported 340 h.p. to be in use there. With the municipality contracting with Commission for a supply of power, the probable load that could be obtained would be small. Estimates will be prepared, however, of the cost of transmitting power to Watford, in connection with other municipalities in this district.

Waterloo

The load on the Waterloo municipal system has continued to show a very satisfactory growth, having increased from 388.5 h.p. taken during October, 1912, to 469 h.p. A representative who has visited Waterloo at various times has reported their electrical department to be in a very satisfactory condition, both as to the construction and as to management and operation.

Waterloo Township

A resolution was received from the Council of the Township of Waterloo asking for an estimated cost of delivering 200 h.p. to Breslau. Estimates were accordingly prepared and a rate of $35.00 per h.p. per year submitted for power suitable for distribution through the village.

A meeting was addressed in this township where the question of supplying Hydro-Electric power to the farms was discussed. In connection with Breslau, estimates were made of the cost of giving rural service from that line. A schedule of rates based on this estimated cost was then prepared, and steps are being taken to deliver power to the farmers in that portion of the township.

See report on Breslau.

Waubaushene

See report on Tay Township.

Welland

A form of agreement covering the supply of 400 h.p. to the Town of Welland was drawn up and signed, arrangements having been made and the proper agreement having been entered into with the Ontario Power Company for the delivery of this power.

By resolution of the Council, the Commission were requested to proceed with the construction of a power and lighting distribution system in the town, it having been agreed that the Commission would build their distribution system, and hand it over in operating condition. A construction engineer was immediately placed in the town and proceeded to lay out plans and place orders for materials.

The Ontario Power Company owned and operated a power distribution system and a transformer station in the town, by means of which power service was given to a number of manufacturers. It was proposed to acquire this system for the town and extend it to give lighting and street lighting service. Negotiations were accordingly entered into with the company towards this end. A valuation was made of this system, and a study was made of the extent of its operations. It was finally arranged that the company should sell their sub-station and distribution system in the town of Welland, and also their 2,200 volt line to Port Robinson with their distributing equipment in that Village. In disposing of this distributing systems, all contracts with consumers of light and power were also assigned to the Town of Welland.

Having completed these arrangements the work of rebuilding and extending this system was immediately put in hand, and carried through to completion.

Welland now enjoys well lighted streets and is doing a good power and lighting business. Though their contract covers the delivery of 400 h.p. this amount has already been exceeded, and the prospects of additional load are such that arrangements are at present being made to increase the capacity of their transformers and lines to give this added service.

With the purchase of the equipment of the Ontario Power Company at Port Robinson, it was arranged that Welland should assume the ownership of this extension, and handle all business arising out of it. The agreement for the supply of power to the Standard Steel Construction Company at Port Robinson, was also assigned to Welland. (See report on Port Robinson.)

Wellandport

See report on St. Ann's District.

Wellesley Township

A representative visited the different villages in the townships of Woolwich and Wellesley, to investigate their several power requirements. This report covered the conditions in St. Clements, Heidelburg, St. Jacob's, Conestogo, Floradale, West Montrose and Winterbourne.

Weston

Assistance was given Weston on various matters of operation and management. A great many consumers have been added to their lists, necessitating changes and extensions to their distribution system. The extent to which their business has increased is shown in the records of the loads taken by Weston during the different months of the year. A steady increase is to be noted from month to month, the demand of 100 h.p. taken during October, 1912 having grown to 151 h.p. during the last current month.

Wheatley

After visiting Wheatley and looking into the question of supplying power there, a representative reported that 165 h.p. was being used. Estimates have been prepared of the cost of transmitting power to Wheatley and will be submitted to the municipality in the near future.

Wilmot Township

In response to a request from the Farmers' Club a representative addressed a public meeting at New Dundee in reference to power in rural districts. As a result of this meeting petitions are being circulated through the township. While in New Dundee, the local power conditions were investigated, all of which were covered in a report.

Winchester

A form of agreement for the supply of 100 h.p. to the Village of Winchester at an estimated cost of $24.00 per h.p. per year, was submitted to the Council for their approval. A representative met the Council for the purpose of explaining the various details of this agreement to them, after which the contract was signed.

It was estimated that $10,650 would be required to cover the cost of a local distribution system in Winchester. The Council were advised of this and a money by-law to authorize the isuing of debentures for this amount was submitted to the ratepayers, and carried by a vote of 154 to 4.

Acting in the capacity of consulting engineers for the village, orders have been placed for materials for the construction of their local distribution and street lighting systems, and construction work is now under way.

Windsor

A form of agreement for the supply of 2,500 h.p. to the City of Windsor was prepared and submitted. This power was to be supplied at an estimated cost of $38.00 per h.p. per year. After discussing the agreement at length with the city authorities, a contract was finally signed.

Immediately after this a representative visited Windsor for the purpose of obtaining complete details, preliminary to laying out power and lighting distribution, and street lighting systems. Information was obtained as to the location of water and gas mains, and also the conduit and overhead systems of telephone, telegraph, distribution and railway companies. An estimate was then prepared of the cost of installing a distribution system to give lighting, power and street lighting service, including ornamental street lights with underground mains in the business section, which was submitted to the local authorities.

Plans for the construction of their distribution system are now in the course of preparation with the intention of commencing work at an early date.

Woolwich Township

See report on Wellesley Township.

Woodslee

It was reported by a representative who visited Woodslee, that 50 h.p. was being used there, which amount was about to be increased to 85 h.p. With the municipality contracting with the Commission for a supply of power, a probable initial load of 35 h.p. could be obtained for their system.

Woodbridge

Estimates were prepared of the cost of delivering power to Woodbridge and a rate of $43.00 per h.p. per year for 100 h.p. suitable for distribution within the municipality was submitted to the local authorities. A number of other estimates were prepared in an endeavor to get a lower rate, by using some different scheme of transmission. This was found to be impossible under the present load conditions in this district.

A private company had made a proposition to the Village of Woodbridge to supply them with power. The proposed agreement drawn up by this company was submitted to the Commission for comment. The various details of the agreement were analyzed and a report was made to the village advising them wherein changes should be made.

Woodstock

The Commission having obtained contracts with certain rural consumers in the township of East Oxford, near Woodstock, the City of Woodstock were requested to take care of this service. It was agreed that the Commission would canstruct the necessary lines and other equipment to give this service, while Woodstock would assume their operation and management, collecting all revenues at rates approved by the Commission. This service is now being given.

Advice was given the local authorities on various questions of management and operation on which they required assistance. The electrical business in Woodstock continues to be carried on in a very satisfactory manner.

At the present time work is in progress of removing pole lines from their business streets, and arranging to give service from the lanes and alleys running along the back of the consumers' premises.

Woodvlile

The enabling by-law was carried in Woodville, there being only one dissenting vote. In laying this by-law before the people, a representative addressed meetings on behalf of the local authorities, explaining Hydro-Electric matters.

A form of agreement for the supply of 70 h.p. to the Village of Woodville was drawn up and submitted, which was afterwards signed. The privately owned plant was valued and an estimate of the cost of reconstructing same was prepared and submitted to the village Council with the recommendation that $4,000.00 be raised to cover this work. A by-law authorizing a debenture issue for that amount was accordingly submitted to the ratepayers and carried.

Wyoming

After making a survey of the power situation in Wyoming, a representative reported 115 h.p. to be in use there. In the event of a contract being signed with the Commission for a supply of power, a probable initial load of 50 h.p. could be obtained for a municipal Hydro-Electric system. Estimates of the cost of transmitting power to Wyoming are to be prepared and submitted in the near future.

York Township

It is noted in the 1912 report that arrangements were made with the Toronto Electric Commissions to give service to certain districts in the Township of York, adjacent to the limits of the city of Toronto. During the year a number of similar districts have applied for service. Whenever conditions warranted the outlay, steps were taken to have these district connected up as extensions to the Toronto Hydro-Electric System. (See report on Toronto.)

Zorra East Township

A petition was received from the Township of East Zorra having 343 names, and asking for an estimate of the cost of service to take care of 5,033 lights and 812 h.p. of motors. To become conversant with all details, a representative went over the whole township and noted the exact location of each petitioner, and conditions to be overcome in giving service, together with all other information of value. Estimates of the cost of this service are at present in the course of preparation.

Zurich

See report on Ailsa Craig.

MUNICIPAL ACCOUNTS

The work of standardizing the Electrical Accounts of the Hydro-Electric municipalities, which was started in 1912, has been carried on. Books have been opened in Seaforth, Elmira, Barrie, Midland, Penetanguishene, Berlin, Collingwood, Milton, Port Dalhousie, Stayner, Coldwater, Elmvale, Beachville, Welland, Hagersville, Caledonia, Dundas, Waterdown, Acton, Georgetown and Rockwood, and the local officers instructed in the proper handling of same.

A revision has also been made of the Electrical Accounts of Port Arthur and Ottawa, bringing them into harmony with the standard.

A periodical inspection has been made of the Electrical Accounts of all the Hydro-Electric municipalities, our accountants assisting the local officers by suggesting better or simpler methods of office routine, and in the case of the smaller towns and villages, where the utility is in charge of men of little or no bookkeeping experience, actually doing all of the accounting and most of the billing.

A system of monthly balance sheets and operating reports has been inaugurated, which has enabled the Provincial Commission to keep in close touch with the local conditions, and this report has been an influence towards a better and more businesslike administration, and is overcoming a natural indifference on the part of officers in the keeping of records from which a report is required but once a year.

From these reports and other data which is collected or worked up by the Auditors of Municipal Accounts, the capital costs and operating expenses are divided into the principal revenue accounts, Domestic Light, Commercial Light, Power and Street Light, these in turn being set against the respective revenues, for the purpose of rate adjustment.

This makes it possible for the Hydro-Electric Power Commission to authorize and enforce a schedule of selling rates in each municipality which makes each of the above named revenue departments self-supporting, so that an excessively high rate in one does not take care of a deficit in another, to the manifest advantage of the latter.

One of the ultimate benefits of these reports anticipated, is a friendly rivalry between the municipalities for an increased load, an efficient and economical administration, and an intelligent effort to improve the load factor which, more than anything else, makes possible reductions in the rates.

The five statistical reports which follow were prepared to give a comprehensive view of the present status and operating results of the electric utilities in the forty-five municipalities where the service has been installed long enough to justify a report.

Statement "A" is a comparative condensed Balance Sheet as of January 1st, 1914, showing the plant cost in natural sub-divisions, and other items making up the total assets. The Liabilities have been divided into two groups, one showing actual liabilities such as Debenture balance, Accounts Payable and Bank Overdraft, and the other Reserve accounts such as Debentures Paid, Sinking Fund Reserve, Depreciation Reserve and Surplus. As it is the practice of the Municipalities to invest the Depreciation Reserve in plant extension rather than placing the money in bank at a low rate of interest and issuing new debentures for extensions at a high interest rate, the total credits to Depreciation reserve and Surplus really show the plant constructed from revenue, or Uncapitalized Plant.

Statement "B" is a condensed operating report for the year ending Dec. 31st, 1913, showing the net result in each municipality. In some cases where the power was turned on subsequent to January 1st, the proportion of the annual fixed charges corresponding to the period of operation has been used, and in other municipalities where the operation covers a very short period, and no actual payment has been made, the fixed charges have been omitted entirely to simplify the accounting in future years and avoid the necessity for annual adjustments.

In some municipalities where it requires from six weeks to two months to close the books for the year, we have used figures taken from the trial balances, which are substantially correct but subject to revision on final audit.

A municipality is not considered self-sustaining unless the revenues are sufficient to meet all ordinary operation and maintenance charges, all the interest, sinking fund or principal payments on debentures, and additions to plant to the extent of 5 per cent. of the capital in lieu of depreciation.

A study of this statement "B" will show that in but one instance has the revenue been insufficient to meet all operating, maintenance and fixed charges, and in but two others has the surplus revenue been insufficient to provide for proper depreciation. In some cases where the operation was for a very short period it has not been considered proper to charge depreciation.

Statement "C" shows in detail the comparative revenues and divisions of expense so that an intelligent comparison may be made of the operation in municipalities of approximately the same size, or where the conditions are known to be similar. In comparing the cost of power purchased the varying price per horse-power must be taken into consideration.

Statement "D" showing the revenue for the years 1912 and 1913, and the number of customers in each class of service at the end of each year is intended to illustrate the rapid expansion of the service in the municipalities where the operation covers a period of two years or longer.

Statement "E" is prepared to show the approximate installation and annual cost per lamp and per capita of the street lighting service in cities, towns and incorporated villages where Hydro service has been installed. The figures are for the calendar year ending December 31st, 1913.

In addition to the information given in detail in these statements, the following summation is of particular interest and value, as it is the answer of the Municipalities to their experiment in the Municipal distribution of Hydro power:—

	Dec. 31st, 1912.	Dec. 31st, 1913.
Number of municipalities included in report	28	45
Operating and maintenance expenses	$1,086,135 00	$1,511,048 00
Debenture charges and interest	291,033 00	479,995 00
Total annual expense	1,377,168 00	1,991,043 00
Total revenue	1,617,674 00	2,611,918 00
Gross surplus for year	240,506 00	620,875 00
Depreciation charge	179,847 00	230,480 00
Net balance, profits in excess of depreciation	60,659 00	390,395 00
Total plant value	6,349,711 00	9,196,483 00
Net debenture debt and overdraft	5,882,156 00	8,353,819 00
Accumulated gross surplus, invested in plant extension	....	861,381 00
Accumulated depreciation reserve	....	410,327 00
Net surplus from operation	....	451,054 00
Approximate number of consumers—Light	33,568	63,157
" " " Power	1,399	2,532
Total	34,967	65,689

STATE

Comparative Condensed Balance Sheets of Electric Departments

—	a Toronto	Ottawa	a Hamilton	London
Assets	$ c.	$ c.	$ c.	$ c.
Lands and Buildings	361,853 70	69,958 53	30,677 72	34,784 12
Sub-Station Equipment	365,360 67	75,277 83	18,230 42	75,742 82
Distribution System, Overhead	1,273,873 85	234,128 27	224,662 72	229,605 94
Underground System	540,772 34	70,812 38	25,808 65	....
Line Transformers	231,868 56	72,016 15	56,030 69	24,594 84
Meters	269,551 16	76,947 05	73,122 68	77,857 33
Street Light Equipment	714,385 02	81,928 55	31,512 39	34,661 57
Miscel. Equip. and Const'n Expense	162,144 50	22,053 88	84,391 84	38,046 18
Steam Plant or Hydraulic Developmt.	....	....	....	....
Old Plant Account	g 649,811 10	....	2,000 00	....
Total Plant	4,569,620 90	703,122 64	546,437 11	590,769 16
Inventories	311,488 91	10,233 72	38,946 65	28,479 87
Accounts Receivable	357,710 44	35,000 00	27,830 06	46,996 49
Sinking Fund	....	66,619 57	18,531 87	....
Other Assets	150,038 78	....	....	....
Bank Balance and Cash	257,998 78	102,134 14	....	11,413 65
Total Assets	5,646,857 81	917,110 07	631,745 69	602 182 81
Liability and Reserve Accounts				
Debenture Balance	4,773,783 90	650,000 00	505,000 00	c 481,900 00
Accounts Payable	427,005 24	18,397 10	30,647 44	65,164 91
Bank Overdraft	....	....	54,421 14	....
Other Liabilities	102.422 22	....	5,396 00	752 00
Total Liabilities	5,303,211 36	668,397 10	595,464 58	547,816 91
Debentures Paid	....	....	....	....
Sinking Fund Reserve	....	66,619 57	18,531 87	....
Depreciation Reserve	171,903 68	156,728 30	8,597 09	21,716 32
Surplus	171,742 77	25,365 10	9,152 15	32,649 58
Total Reserves	343,646 45	248,712 97	36,281 11	54,365 90
Total	5,646,857 81	917,110 07	631,745 69	602,182 81

MENT "A"

of Hydro Municipalities as of January 1st, 1914

Berlin	a Pt. Arthur	St. Thomas	Guelph	Stratford	Galt	Woodstock
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
21,344 64	....	9,676 56	17,346 11	16,837 50	10,230 85	7,331 95
54,847 73	219 89	28,426 76	53,239 13	20,779 41	15,145 48	26,870 13
69,688 70	118,326 45	56,575 75	31,766 69	74,403 84	77,483 93	28,907 57
....	....	....	....	....	32,918 23	....
24,281 17	5,644 05	11,076 90	6,355 98	12,897 73	14,831 91	15,638 52
25,495 55	14,869 90	14,930 85	15,977 58	13,526 22	16,826 68	12,009 27
18,004 26	21,639 51	11,553 31	22,254 45	5,971 43	7,694 03	10,047 72
5,953 74	3,770 05	3,229 05	6,513 12	7,828 37	5,993 11	15,805 26
....	381,432 72	....	....	....	....	15,743 62
47,610 01	....	7,794 75	....	11,187 00	....	....
267,225 80	545,902 57	143,263 93	153,453 06	163,431 50	181,124 22	132,354 04
4,447 31	....	....	47,673 54	1,537 94	636 35	191 65
6,584 65	....	10,924 35	8,770 52	6,933 63	....	....
....	....	....	....	6,806 17	10,582 92	28,858 51
40,893 63	....	....	396 50	263 82	....	....
3,767 13	....	21,967 29	3,178 10	350 12	....	9,534 36
322,918 52	b	176,155 57	213,471 72	179,323 18	192,343 49	170,938 56
257,659 13	c 496,500 00	94,039 74	119,084 02	128,470 00	136,000 00	107,385 63
8,384 27	....	5,958 17	3,272 91	11,662 22	....	....
....	....	....	....	430 00	25,667 34	....
....	....	....	....	....	....	....
266,043 40	....	99,997 91	122,356 93	140,562 22	161,667 34	107,385 63
42,490 87	....	16,960 26	25,865 97	15,330 00	....	....
....	....	....	....	6,806 17	10,582 92	28,858 51
....	....	15,818 44	37,846 12	12,493 42	14,900 00	9,442 40
14,384 25	....	43,378 96	27,402 70	4,131 37	5,193 23	25,252 02
56,875 12	....	76,157 66	91,114 79	38,760 96	30,676 15	63,552 93
322,918 52	b	176,155 57	213,471 72	179,323 18	192,343 49	170,938 56

STATEMENT

Comparative Condensed Balance Sheets of Electric Departments

——	Collingwood	Barrie	Welland	Ingersoll
ASSETS	$ c.	$ c.	$ c.	$ c.
Lands and Buildings	4,343 60	12,034 61	5,156 40	3,057 57
Sub-Station Equipment	42 80	20,535 59	8,017 13	10,232 56
Distribution System Overhead	23,438 67	16,107 32	35,569 34	28,350 21
Underground System	....	....	....	....
Line Transformers	4,697 25	3,032 71	9,517 57	6,587 48
Meters	7,524 05	13,400 87	5,264 74	6,740 80
Street Light Equipment	2,400 03	1,823 96	1,764 27	2,273 84
Miscel. Equip. and Const'n Expense.	4,631 89	757 49	5,655 38	8,253 30
Steam Plant or Hydraulic Developmt.	....	31,212 48	....	....
Old Plant Account	5,455 75	....	....	22,368 53
Total Plant	52,534 04	98,905 03	70,944 83	87,864 29
Inventories	939 68	2,789 01	979 11	805 63
Accounts Receivable	1,918 23	3,881 65	209 4[illegible]	10,358 54
Sinking Fund	....	....	....	4,664 10
Other Assets	....	....	....	....
Bank Balance and Cash	5,821 88	3,751 54	131 28	....
Total Assets	61,213 83	109,327 23	72,264 71	103,692 56
LIABILITY AND RESERVE ACCOUNTS				
Debenture Balance	37,950 42	55,755 06	d..........	79,800 00
Accounts Payable	5,431 47	978 70	71,301 37	945 62
Other Liabilities	....	....	704 72	10,909 10
Bank Overdraft	4 64	16 44	....	....
Total Liabilities	43,386,53	56,750 20	72,006 09	91,654 72
Debentures Paid	14,415 60	31,244 94	....	....
Sinking Fund Reserve	....	....	....	4,664 10
Depreciation Reserve	2,390 00	3,350 00	....	2,862 00
Surplus	1,021 70	17,982 09	258 62	4,511 74
Total Reserves	17,827 30	52,577 03	258 62	12,037 84
Total	61,213 83	109,327 23	72,264 71	103,692 56

"A"—Continued

of Hydro Municipalities as of January 1st, 1914

Midland	Waterloo	Dundas	Preston	Penetang	St. Mary's	Brampton
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
4,780 69	4,646 71	....	....	2,151 00	13,674 27	3,808 08
8,407 78	11,600 73	2,060 66	12,076 92	3,507 71	12,909 54	5,181 32
28,904 82	29,977 46	32,550 60	27,687 13	22,801 32	17,621 88	30,628 36
....	....	....	....	....	....	....
6,661 19	6,766 62	5,436 92	11,345 64	3,343 58	9,877 87	8,779 81
9,416 34	6,030 43	5,476 70	8,890 62	4,400 93	6,582 18	7,998 00
3,421 85	4,095 33	502 81	1,903 86	1,607 91	2,148 40	1,714 47
3,500 58	1,389 00	3,522 21	4,708 43	278 93	1,601 75	2,895 62
....	2,483 64	....	....	....	....	....
7,382 84	10,131 25	....	24,007 28	2,940 00	....	....
72,476 09	77,121 17	49,549 90	90,619 88	41,031 38	64,415 89	61,005 66
90 06	971 59	3,467 33	....	411 43	200 00	372 34
....	2,615 55	....	6,435 01	....	1,715 00	....
....	....	....	....	....	....	....
....	....	....	....	....	229 95	15,000 00
6,707 06	....	....	....	....	7,427 19	....
79,273 21	80,708 31	53,017 23	97,054 89	41,442 81	73,988 03	76,378 00
42,997 23	53,507 14	19,629 72	55,986 64	29,490 67	43,779 84	66,593 77
578 64	942 18	....	1,626 88	....	9,476 77	....
....	3,272 39	28,425 90	21,170 65	1,892 14	....	1,200 08
....	....	....	150 47	....	....	....
43,575 87	57,721 71	48,055 62	78,934 64	31,382 81	53,256 61	67,793 85
10,752 77	1,916 86	370 28	3,878 87	1,509 33	17,177 88	2,456 87
....	....	....	....	....	....	....
5,800 00	7,950 00	1,508 00	6,348 34	3,485 00	....	5,200 00
19,144 57	13,119 74	3,083 33	7,893 04	5,065 67	3,553 54	927 28
35,697 34	22,986 60	4,961 61	18,120 25	10,060 00	20,731 42	8,584 15
79,273 21	80,708 31	53,017 23	97,054 89	41,442 81	73,988 03	76,378 00

STATEMENT

Comparative Condensed Balance Sheets of Electric Departments

—	Tillsonburg	Hespeler	Mitchell	Weston
ASSETS	$ c.	$ c.	$ c.	$ c.
Lands and Buildings	1,896 47	3,499 23	4,217 24	3,230 94
Sub-Station Equipment	6,818 47	8,500 83	9,034 86	4,985 23
Distribution System, Overhead	17,522 44	5,702 58	5,981 19	9,723 63
Underground System	....	....	....	....
Line Transformers	4,041 90	4,025 26	823 82	4,158 10
Meters	3,613 36	3,594 78	1,518 97	2,779 93
Street Light Equipment	1,762 50	718 95	461 41	1,361 12
Miscel. Equip. and Const'n Expense	918 83	93 08	....	2,896 21
Steam Plant or Hydraulic Developmt.	....	....	1,500 00	....
Old Plant Account	....	3,000 00	....	....
Total Plant	36,573 97	29,134 71	23,537 49	29,135 16
Inventories	234 43	508 82	584 59	86 70
Accounts Receivable	3,668 22	250 00	1,409 64	632 07
Sinking Fund	....	....	....	....
Other Assets	1,500 00	e 1,797 07	....	....
Bank Balance and Cash	414 95	....	....	91 86
Total Assets	42,391 57	31,690 60	25,531 72	29,945 79
LIABILITY AND RESERVE ACCOUNTS				
Debenture Balance	34,971 49	18,899 82	11,684 02	18,626 50
Accounts Payable	1,600 00	11,120 09	....	543 78
Bank Overdraft	....	....	732 17	....
Other Liabilities	....	....	....	....
Total Liabilities	36,571 49	30,019 91	12,416 19	19,170 28
Debentures Paid	1,028 51	1,670 69	3,167 76	1,341 38
Sinking Fund Reserve	....	....	....	....
Depreciation Reserve	2,606 50	....	2,177 21	2,650 00
Surplus	2,185 07	....	7,770 56	6,784 13
Total Reserves	5,820 08	1,670 69	13,115 53	10,775 51
Total	42,391 57	31,690 60	25,531 72	29,945 79

"A"—Continued

of Hydro Municipalities as of January 1st, 1914

Milton	Seaforth	Georgetown	Acton	New Hamburg	Mimico	Pt. Dalhousie
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
....	1,194 00	12 00	1,500 00	2,257 59	98 30	....
4,940 19	6,031 75	....	597 62	1,054 90	....	....
8,758 21	13,325 50	9,464 24	4,515 63	7,865 33	10,563 83	2,191 89
....	....	....	....	....	....	....
872 43	2,589 49	1,978 76	1,310 00	2,664 75	965 88	1,732 75
2,291 32	2,854 15	2,235 98	1,347 00	2,578 62	2,740 79	185 71
935 43	797 34	903 94	886 81	1,077 93	543 90	220 95
2,061 49	310 98	669 51	777 99	903 53	694 38	386 66
....	....	....	....	....	....	....
4,318 66	....	2,750 05	....	5,324 56	....	6,325 50
24,177 73	27,103 21	18,014 48	10,935 05	23,727 21	15,607 08	11,043 46
113 00	1,038 98	....	187 00	559 00	375 37	145 50
3,675 84	66 01	341 66	....	3,776 79	82 05	1,246 67
....	909 33	....	3,752 00	....	....	....
....	....	....	....	....	....	....
321 83	745 65	2,951 30	663 05	....	398 13	72 58
28,288 40	29,863 18	21,307 44	15,537 10	28,063 00	16,462 63	12,508 21
23,145 10	21,000 00	20,000 00	14,500 00	17,151 94	14,685 80 d	
798 00	....	....	....	462 00	211 25	11,957 44
....	4,000 00	....	....	3,234 39	....	....
....	....	....	....	....	....	....
23,943 10	25,000 00	20,000 00	14,500 00	20,848 33	14,897 05	11,957 44
1,173 56	909 33	....	....	1,714 11	314 20	....
....	....	....	202 00	....	....	....
900 00	1,300 00	300 00	500 00	2,045 00	740 00	450 00
2,271 74	2,653 85	1,007 44	335 10	3,455 56	511 38	100 77
4,345 30	4,863 18	1,307 44	1,037 10	7,214 67	1,565 58	550 77
28,288 40	29,863 18	21,307 44	15,537 10	28,063 00	16,462 63	12,508 21

STATEMENT

Comparative Condensed Balance Sheets of Electric Departments

	Norwich	Hagersville	Baden	Stayner
Assets				
Lands and Buildings	655 00	....	660 64	....
Sub-Station Equipment	....	....	....	....
Distribution System Overhead	6,373 65	5,177 94	3,416 34	1,211 03
Underground System	....	....	....	....
Line Transformers	828 37	264 30	606 38	300 00
Meters	1,717 47	400 11	514 55	635 78
Street Light Equipment	520 56	359 56	342 72	86 31
Miscel. Equip. and Const'n Expense	680 54	346 40	....	128 40
Steam Plant or Hydraulic Developmt.	....	....	....	....
Old Plant Account	3,509 82	....	....	7,657 15
Total Plant	14,285 41	6,558 31	5,540 63	10,018 67
Inventories	716 13	....	....	33 75
Accounts Receivable	1,557 53	....	....	336 86
Sinking Fund	....	....	....	....
Other Assets	....	....	....	....
Bank Balance and Cash	....	....	330 43	866 87
Total Assets	16,559 07	6,548 31	5,871 06	11,256 15
Liability and Reserve Accounts				
Debenture Balance	13,422 51	6,000 00	4,843 68	8,755 34
Accounts Payable	1,044 85	357 81	115 22	2,186 72
Bank Overdraft	132 12	164 25	....	....
Other Liabilities	....	....	....	....
Total Reserves	14,599 48	6,522 06	4,958 90	10,942 06
Debentures Paid	333 49	....	156 32	244 66
Sinking Fund Reserve	....	....	....	....
Depreciation Reserve	500 00	....	277 00	....
Surplus	1,126 10	26 25	478 84	69 43
Total	1,959 59	26 25	912 16	314 09
Total Liabilities	16,559 07	6,548 31	5,871 06	11,256 15

a Approximate figures. Regular audit not completed.
b Accounts not yet separated from City books, and no separate balance sheet.
c Total debenture issue. Credits from payments on principal and sinking fund still in City books.

"A"—Concluded

of Hydro Municipalities as of January 1st, 1914

Caledonia	Coldwater	Pt. Stanley	Elmvale	Water-down	Rockwood	Beachville	Pt. Credit
....	275 00	1,195 99	106 25	....	79 00	161 03	675 00
....	....	....	....	....	....	....	....
3,468 28	5,179 40	8,635 69	5,369 35	5,323 22	3,533 29	6,238 17	6,428 27
....	....	....	....	....	....	....	....
318 00	797 57	1,169 56	268 85	1,056 10	894 50	604 85	439 12
378 57	972 07	1,553 58	773 70	789 34	488 13	579 83	1,126 28
161 65	354 20	570 60	298 93	116 96	254 58	237 03	254 09
545 31	132 53	5,517 16	605 93	88 34	277 01	540 36	610 26
....	....	....	....	....	....	....	....
....	....	1,000 00	....	....	....	....	....
4,871 81	7,710 77	19,642 58	7,423 01	7,373 96	5,526 51	8,361 27	9,533 02
....	....	....	....	....	56 76	50 00	18 46
....	1,849 84	....	36 00	....	....	1,502 85	371 06
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
127 82	....	2,584 50	....	274 45	....	2,972 79	609 80
4,999 63	9,560 61	22,227 08	7,459 01	7,648 41	5,583 27	12,886 91	10,532 34
d	7,000 00	18,153 58	6,894 64	6,303 41	2,000 00	5,360 00	7,268 56
4,410 95	....	....	69 75	....	....	6,013 07	1,300 83
....	1,690 60	....	344 68	....	3,034 13	....	208 10
....	....	....	....	....	....	....	....
4,410 95	8,690 60	18,153 58	7,309 07	6,303 41	5,034 13	11,373 07	8,777 49
....	....	796 42	105 36	196 59	....	f	231 44
....	....	....	....	....	....	....	....
250 00	375 00	1,388 08	....	365 00	....	525 00	446 00
338 68	495 01	1,889 00	44 58	783 41	549 14	988 84	1,077 41
588 68	870 01	4,073 50	149 94	1,345 00	549 14	1,513 84	1,754 85
4,999 63	9,560 61	22,227 08	7,459 01	7,648 41	5,583 27	12,886 91	10,532 34

d Debentures issued but not sold at date of report.
e Includes $1,737.07 accumulated operating losses due to maintenance of steam plant.
f Amount paid on debentures not yet separated from surplus.
g Work orders incompleted and Exhibition.

STATE

Report showing operation of Municipalities

Municipality.	Plant Cost	Debentures and Overdraft	Operation and Maintenance	Fixed Charges	Total Operation
	$ c.	$ c.	$ c.	$ c.	$ c.
Toronto (a)	3,919,809 80	5,149,803 65	670,082 78	239,951 08	910,033 86
Ottawa	703,122 64	500,000 00	111,322 00	30,961 54	142,283 54
Hamilton (a)	546,437 11	486,468 13	74,514 40	17,416 18	91,930 58
London	590,769 16	481,900 00	126,323 86	28,831 47	155,155 33
Berlin (g)	267,225 80	257,659 13	51,292 70	17,897 45	69,190 15
Port Arthur (a)	545,902 57	496,500 00	68,282 71	38,409 37	106,692 08
St. Thomas	143,263 93	94,039 74	41,561 36	7,402 65	48,964 01
Guelph	153,453 06	119,084 02	47,294 58	10,273 27	57,567 85
Stratford	163,431 50	121,663 83	31,808 58	10,536 75	42,345 33
Galt	181,124 22	151,084 42	23,563 01	9,721 64	33,284 65
Woodstock	132,354 04	78,527 12	28,598 86	6,853 83	35,452 69
Collingwood	52,534 04	37,950 42	13,492 17	4,277 77	17,769 94
Barrie	98,905 03	55,755 06	17,540 63	5,590 40	23,131 03
Welland	70,944 83	64,016 63	6,660 53	711 19	7,371 72
Ingersoll	87,864 29	75,135 90	16,313 16	5,337 25	21,650 41
Midland	72,476 09	42,997 23	9,289 07	4,134 55	13,423 62
Waterloo (g)	77,121 17	53,507 14	17,830 01	3,675 97	21,505 98
Dundas	49,549 90	48,055 62	6,001 12	1,970 14	7,971 26
Preston	90,619 88	77,157 29	21,468 32	4,120 54	25,588 86
Penetang	41,031 38	29,490 67	9,319 95	2,035 90	11,355 85
St. Mary's	64,415 89	49,555 89	14,183 25	4,616 15	18,799 40
Brampton	61,005 66	67,793 85	13,934 43	3,781 62	17,716 05
Tillsonburg	36,573 97	34,971 45	10,247 52	2,137 07	12,384 59
Hespeler	29,134 71	30,019 91	9,018 45	2,140 19	11,158 64
Seaforth	23,537 49	24,090 67	10,190 52	1,653 65	11,845 17
Weston	29,135 16	18,626 50	7,531 92	1,588 48	9,120 40
Milton	24,177 73	23,145 10	5,112 43	1,582 93	6,695 36
Mitchell	27,103 21	11,684 02	8,320 90	2,224 07	10,544 97
Georgetown	18,014 48	20,000 00	972 91	484 33	1,457 24
Acton	10,935 05	10,748 00	3,022 37	1,124 06	4,146 43
New Hamburg	23,727 21	17,751 94	6,724 08	1,170 92	7,895 00
Mimico	15,607 08	14,685 80	2,174 95	845 02	3,019 97
Port Dalhousie	11,043 46	11,957 44	3,970 83	814 89	4,785 72
Norwich	14,285 41	14,467 36	4,272 92	886 40	5,159 32
Hagersville	6,558 31	6,000 00	1,004 92	97 60	1,102 52
Baden	5,540 63	4,843 68	3,103 33	325 26	3,428 59
Stayner	10,018 67	8,755 34	202 00	340 82	542 82
Caledonia	4,871 81	4,410,95	783 78	328 09	1,111 88
Coldwater	7,710 77	7,000 00	644 86	455 36	1,100 22
Port Stanley	19,642 58	18,153 58	4,522 20	1,188 91	5,711 11
Elmvale	7,423 01	6,894 64	589 31	299 76	889 07
Waterdown	7,373 96	6,303 41	1,420 16	521 56	1,941 72
Rockwood	5,526 51	5,034 13	281 96	225 99	507 95
Beachville	8,361 27	5,360 00	4,729 51	518 86	5,248 37
Port Credit	9,533 02	7,268 56	1,525 95	534 23	2,060 18

Figures in italics denote credits. a Approximate Report. Accounts not yet audited.
f Gross profit not sufficient to provide for full 5% depreciation due to small power load and poor diversity factor. g 13 months operation and revenue due to change in fiscal year.
h Depreciation at 2½% account special construction.

MENT "B"

for Period ending December 31st, 1913

Revenue	Gross Surplus	Depreciation	Net Surplus	Number of Customers			
				House	Comm'l	Power	Total
$ c.	$ c.	$ c.	$ c.				
1,151,128 89	241,095 03	(h) 91,819 92	149,275 11	16,519	4,764	1,037	22,320
191,648 64	49,365 10	24,000 00	25,365 10	5,766	829	141	6,736
110,496 42	18,565 84	(k) 8,597 09	9,968 75	5,117	924	209	6,250
192,224 47	37,069 14	21,716 32	15,352 82	5,201	1,007	198	6,406
94,555 19	25,365 04	10,980 79	14,384 25	1,291	470	127	1,888
171,514 02	64,821 94	(b)	64,821 94	3,409	500	55	3,964
75,124 04	26,160 03	6,900 00	19,260 03	951	329	70	1,350
80,726 82	23,158 97	8,000 00	15,158 97	1,260	400	85	1,745
55,983 70	13,638 35	3,420 00	10,218 35	1,084	367	92	1,543
45,233 73	11,949 08	8,400 00	3,549 08	1,122	353	65	1,540
46,859 86	11,407 17	5,827 40	5,579 77	636	282	55	973
21,181 64	3,411 70	2,390 00	1,021 70	477	220	18	715
27,245 02	4,113 99	3,350 00	763 99	763	200	13	976
7,630 34	258 62	(c)	258 62	408	53	18	479
30,176 00	8,525 59	2,862 00	5,663 59	278	170	44	492
21,362 56	7,938 94	2,950 00	4,988 94	491	172	25	688
29,626 32	8,120 34	3,100 00	5,020 34	321	125	44	490
11,300 43	3,329 17	1,508 00	1,821 17	377	134	27	538
34,688 57	9,099 71	2,924 00	6,175 71	526	151	28	705
17,318 91	5,963 06	1,820 00	4,143 06	128	91	15	234
20,173 22	1,373 82	3,200 00	(d) *1,826 18*	396	160	29	585
23,661 98	5,945 93	2,500 00	3,445 93	643	138	16	797
16,001 19	3,616 60	1,782 75	1,833 85	254	143	17	414
10,418 05	(e) *740 59*	1,450 00	(d) *2,190 59*	174	76	11	261
14,388 08	2,542 91	1,300 00	1,242 91	178	105	10	293
13,836 79	4,716 39	1,390 00	3,326 39	360	34	6	400
9,867 10	3,171 74	900 00	2,271 74	110	74	5	189
13,459 54	2,914 57	1,150 00	1,764 57	179	85	16	280
2,280 35	823 11	300 00	523 11	160	120	5	285
4,409 45	263 04	500 00	(d) *236 96*	82	62	3	147
11,424 57	3,529 57	900 00	2,629 57	142	63	8	213
3,803 55	783 58	740 00	43 58	250	....	5	255
5,336 49	550 77	450 00	100 77	238	....	3	241
6,400 52	1,241 20	500 00	741 20	166	76	3	245
1,128 77	26 25	(c)	26 25	3	24	3	30
3,957 83	529 24	277 00	252 24	75	....	2	77
612 25	69 43	(c)	69 43	120	30	2	152
1,458 94	347 06	250 00	97 06	17	16	1	34
1,514 87	414 65	350 00	64 65	48	32	2	82
8,217 86	2,506 75	617 75	1,889 00	182	60	9	251
933 65	44 58	(c)	44 58	52	52	1	105
2,516 94	575 22	365 00	210 22	70	34	2	106
907 09	399 14	(c)	399 14	48	9	1	58
6,762 21	1,513 84	525 00	988 84	45	....	4	49
3,507 81	1,447 63	446 00	1,001 63	93	21	2	116

b No depreciation included, account 15 year debentures and large investment in hydraulic development. c No depreciation. Operating less than a year.

d Not sufficient profit to provide for depreciation. Operating costs high, due to abnormal line and transformation losses. A remedy is now being worked out. The net showing is $2,455.01 better than in 1912.

e Heavy operating costs due to maintenance of steam plant, which has now been eliminated.

k Depreciation at 3% account special construction.

STATE

Comparative Detailed Operating Reports of

For the year ending

—	Toronto	Ottawa	Hamilton	London	Berlin
Revenues	$ c.	$ c.	$ c.	$ c.	$ c.
Domestic Lighting	185,797 67	68,032 27	34,131 61	41,194 92	16,558 82
Commercial Lighting	231,255 71	53,438 04	25,453 99	38,156 85	20,985 35
Power	345,620 60	26,978 76	47,415 58	79,637 50	38,368 34
Street Lighting	344,933 79	43,199 57	2,250 89	28,372 20	17,373 81
Miscellaneous	43,521 11	....	1,244 35	4,863 00	1,268 87
Total Revenue	1,151,128 89	191,648 64	110,496 42	192,224 47	94,555 19
Operating Expenses					
Power Purchased	255,986 26	50,750 00	47,307 65	72,676 41	33,359 47
Sub-Station Operation ...	32,216 66	3,127 63	2,842 26	6,335 99	4,892 72
Sub-Station Maintenance..	11,510 69	107 58	492 72	....	1,175 64
Distributi'n, Oper. & M't'ce	50,693 34	13,694 44	3,168 21	3,952 62	1,575 15
Transformer Maintenance.	3,396 98	245 82	1,216 21	2,080 59	205 39
Meter Maintenance	1,648 28	1,537 17	16 39	1,122 57	326 51
Consumers' Premises Exp.	36,536 64	10,572 43	2,607 62	1,827 71	101 97
Street Light Oper. & M't'c'e	45,801 72	15,465 59	1,289 38	5,278 72	2,803 88
Promotion of Business....	58,908 53	1,008 50	4,391 01	5,833 84	452 28
Billing and Collecting....	35,081 71	6,417 69	6,270 38	6,738 13	1,901 40
General Office Salaries....	65,458 23	6,941 68	2,532 11	7,338 12	2,093 53
General Office Expenses...	24,415 16		1,046 35	6,842 08	438 72
Maint'nan'e Utility Equip't	22,753 71	....	722 85	4,154 38	1,262 56
Undistributed Expenses...	25,674 87	1,453 47	611 26	2,142 70	703 48
Interest	179,198 09	....	8,409 13	19,351 72	10,686 20
Debenture or Sinking Fund	60,752 99	30,961 54	9,007 05	9,479 75	7,211 25
Depreciation Allowance ..	91,819 92	24,000 00	8,597 09	21,716 32	10,980 79
Total Expenses	1,001,853 78	166,283 54	100,527 67	176,871 65	80,170 94
Net Surplus	149,275 11	25,365 10	9,968 75	15,352 82	14,384 25
Net Loss	....	....	....	....	....
	1,151,128 89	191,648 64	110,496 42	192,224 47	94,555 19

MENT "C"

Electric Departments of Hydro Municipalities

December 31st, 1913

Pt. Arthur *w*	St. Thomas	Guelph	Stratford	Galt	Woodstock	Collingwood	Barrie *b*	Welland *c*
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
105,056 50	11,125 50	11,528 09	11,636 59	10,535 38	6,495 02	16,375 83	19,024 18	1,369 67
l	16,097 41	15,075 61	17,033 98	11,648 49	12,942 32	*l*	*l*	558 46
51,748 11	36,550 26	42,091 34	15,123 78	16,575 61	20,262 52	896 72	3,390 29	4,307 21
14,709 41	10,989 72	9,500 04	12,120 00	6,280 25	7,160 00	3,802 88	4,292 53	1,395 00
....	361 15	2,531 74	69 33	194 00	....	106 21	478 02	....
171,514 02	75,124 04	80,726 82	55,983 68	45,233 73	46,859 86	21,181 64	27,185 02	7,630 34
43,664 83	31,435 85	32,473 66	22,028 75	17,883 91	18,798 66	7,480 48	6,611 27	4,861 38
5,587 34	2,452 25	1,700 14	1,651 06	1,761 14	1,834 83	1,952 60	*n*5,706 97	295 43
192 13	913 99	1,076 44	200 54	180 76	497 39	....	....	....
10,598 22	1,580 22	3,004 51	1,630 72	446 24	1,827 65	1,374 21	679 16	191 18
....	47 57	179 90	148 48	11 48	4 84	9 19	....	32 82
113 88	53 40	585 91	261 33	2 00	70 75	13 37	17 92	50
322 64	....	206 39	*v* 501 90	....	345 00	....	....	....
1,543 03	2,405 21	1,566 58	1,509 91	296 88	1,142 30	133 20	402 06	123 82
361 85	....	....	....	....	....	....	....	....
2,630 19	339 43	430 35	1,325 47	1,188 20	1,115 75	252 08	....	317 42
1,330 44	*o*	1,297 25	1,419 51	*o*	*o*	*o*	*o*	*o*
983 17	1,593 77	2,127 52	919 76	1,638 80	2,513 73	2,066 94	3,578 67	798 53
....	....	*p* 884 95	....	153 60	....	....	....	....
954 99	739 67	1,760 98	....	....	447 96	209 90	544 58	39 45
....	....	....	211 15	5,729 29	4,202 40	....	....	711 19
*q*38,409 37	*q*7,402 65	*q*1,027 27	10,536 75	3,992 35	2,651 43	*q*4,277 77	*q*5,590 40	*s*
r	6,900 00	8,000 00	3,420 00	8,400 00	5,827 40	2,390 00	3,350 00	....
106,692 08	55,864 01	65,567 85	45,765 33	41,684 65	41,280 09	20,159 94	26,481 03	7,371 72
64,821 94	19,260 03	15,158 97	10,218 35	3,549 08	5,579 77	1,021 70	703 99	258 62
....	....	....	....	....	....	....	....	....
171,514 02	75,124 04	80,726 82	55,983 68	45,233 73	46,859 86	21,181 64	27,185 02	7,630 34

STATEMENT

Comparative Detailed Operating Reports of

For the year ending

—	Ingersoll	Midland	aWaterloo	Dundas	Preston	Penetang
Revenues	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Domestic Lighting	3,595 03	6,095 11	4,263 66	3,045 85	5,477 10	1,989 80
Commercial Lighting	6,048 51	6,104 16	5,098 42	4,193 27	5,366 77	4,511 16
Power	15,293 44	5,700 22	14,970 14	3,070 40	21,017 68	8,775 95
Street Lighting	4,262 03	3,463 07	5,284 10	60 10	2,594 55	2,042 00
Miscellaneous	976 99	....	....	930 81	232 47	....
Total Revenue	30,176 00	21,362 56	29,626 32	11,300 43	34,688 57	17,318 91
Operating Expenses						
Power Purchased	11,966 61	6,059 33	11,075 53	3,474 08	16,673 20	6,347 56
Sub-Station Operation	828 83	....	1,019 10	....	1,459 16	967 84
Sub-Station Maintenance	....	....	81 00	....	49 21	....
Distributi'n, Oper. & M't'ce	422 13	989 11	378 74	154 77	1,238 36	301 41
Transformer Maintenance	187 39	57 20	32 13	35 80	280 22	236 11
Meter Maintenance	97 00	....	54 67	4 40	79 67	....
Consumers' Premises Exp.	....	....	....	....	....	....
Street Light Oper. & M't'c'e	440 09	526 53	1,093 25	....	431 92	144 56
Promotion of Business	....	....	....	....	....	....
Billing and Collecting	560 15	221 04	866 90	689 51	656 75	44 45
General Office Salaries	o	....	....	....	....	....
General Office Expenses	1,615 40	1,435 86	2,519 50	1,642 56	415 98	1,278 02
Maint'nan'e Utility Equip't	....	....	....	....	....	....
Undistributed Expenses	195 56	....	709 19	....	183 85	....
Interest	....	2,019 21	....	....	2,139 62	1,431 63
Debenture or Sinking Fund	q5,337 25	2,115 34	q 3,675 97	q 1,970 14	1,980 92	604 27
Depreciation Allowance	2,862 00	2,950 00	3,100 00	1,508 00	2,924 00	1,820 00
Total Expenses	24,512 41	16,373 62	24,605 98	9,479 26	28,512 86	13,175 85
Net Surplus	5,663 59	4,988 94	5,020 34	1,821 17	6,175 71	4,143 06
Net Loss	....	....	....	....	....	....
	30,176 00	21,362 56	29,626 32	11,300 43	34,688 57	17,318 91

"C"—Continued

Electric Departments of Hydro Municipalities

December 31st, 1913

St. Mary's	Brampton	Tillson-burg	Hespeler	Seaforth	Weston	Milton	Mitchell	*d*George-town
$ c.	$ c.	$ c.	$ c.	$ c.	$ c	$ c.	$ c.	$ c.
3,815 77	5,617 61	2 796 57	3,873 75	2,124 18	4,117 20	1,149 28	2,424 59	661 49
4,553 73	3,986 65	4,677 38	*l*	2,876 47	1,475 74	1,212 26	2,813 92	842 87
8,221 72	10,557 72	4,763 13	5,044 30	7,509 99	6,166 97	6,462 38	6,160 53	234 32
3,582 00	3,500 00	2,601 00	1,500 00	1,815 81	2,052 00	900 00	1,675 00	541 67
....	....	1,163 11	....	61 63	24 88	143 18	385 50	....
20,173 22	23,661 98	16,001 19	10,418 05	14,388 08	13,836 79	9,867 10	13,459 54	2,280 35
10,055 82	11,084 34	6,249 35	5,208 18	7,931 55	5,159 49	4,902 34	6,858 86	759 00
728 39	....	950 05	2,101 87	....	....	....	....	....
150 46	26 11	....	....	....	....	....	12 35	....
556 05	231 54	332 50	638 83	1,573 93	741 47	167 82	81 25	12 85
519 39	16 00	4 89	....	....	50 30	....	....	....
202 56	....	....	4.17	....	....	....	....	....
....	....	....	....	....	....	....	....	....
554 36	168 79	205 87	57 50	317 37	574 25	....	44 64	....
....	....	....	....	....	....	....	....	....
263 21	341 70	907 04	87 73	....	327 00	....	....	....
....	....	....	....	....	....	....	....	....
1,077 38	1,694 67	1,064 21	647 50	368 67	599 91	42 27	1,223 80	201 06
....	....	....	....	....	....	....	....	....
75 63	371 28	533 61	272 67	....	79 50	....	100 00	....
....	2,526 10	....	....	....	....	....	....	....
*q*4,616 15	1,255 32	*q*2,137 07	*q*2,140 19	*q*1,653 65	*q*1,588 48	*q*1,582 93	*q*2,224 07	*q* 484 33
3,200 00	2,500 00	1,782 75	1,450 00	1,300 00	1,390 00	900 00	1,150 00	300 00
21,999 40	20,216 05	14,167 34	12,608 64	13,145 17	10,510 40	7,595 36	11,694 97	1,757 24
....	3,445 93	1,833 85	....	1,242 91	3,326 39	2,271 74	1,764 57	523 11
1,826 18	....	....	2,190 59	....	....	....	....	....
20,173 22	23,661 98	16,001 19	10,418 05	14,388 08	13,836 79	9,867 10	13,459 54	2,280 34

STATEMENT

Comparative Detailed Operating Reports of

For the year ending

—	Acton	New Hamburg	Mimico	*e* Pt. Dalhousie	Norwich	*f* Hagersville
Revenues	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Domestic Lighting	1,236 50	1,589 21	2,021 06	3,742 54	1,926 78	81 92
Commercial Lighting	1,567 48	1,890 72	*l*	*l*	1,162 98	*l*
Power	318 77	5,792 20	795 49	347 28	1,978 55	746 85
Street Lighting	1,000 00	1,827 00	987 00	1,246 67	1,285 50	300 00
Miscellaneous	286 72	325 44	....	....	46 71	....
Total Revenue	4,409 47	11,424 57	3,803 55	5,336 49	6,400 52	1,128 27
Operating Expenses						
Power Purchased	1,801 50	5,206 00	1,740 66	3,293 00	3,176 24	967 23
Sub-Station Operation	....	....	....	....	....	....
Sub-Station Maintenance	....	....	....	....	....	....
Distributi'n, Oper. & M't'ce	379 17	323 40	144 79	253 81	178 90	....
Transformer Maintenance	....	....	....	....	....	....
Meter Maintenance	....	....	....	....	....	....
Consumers' Premises Exp.	....	....	....	....	....	....
Street Light Oper. & M't'c'e	....	....	23 89	8 74	79 51	....
Promotion of Business	....	....	....	....	....	....
Billing and Collecting	....	610 75	....	....	....	....
General Office Salaries	....	....	....	....	....	....
General Office Expenses	841 70	583 73	265 61	302 30	838 27	37 69
Maint'nan'e Utility Equip't	....	....	....	....	....	....
Undistributed Expenses	....	....	....	112 98	....	....
Interest	....	....	....	*u* 814 89	....	....
Debenture or Sinking Fund	*q* 1,124 06	*q* 1,170 92	*q* 845 02	....	*q* 886 40	*t* 97 60
Depreciation Allowance	500 00	900 00	740 00	450 00	500 00	....
Total Expenses	4,646 43	8,795 00	3,759 97	5,235 72	5,659 32	1,102 52
Net Surplus	....	2,629 57	43 58	100 77	741 20	26 25
Net Loss	236 96	....	....	....	....	....
	4,409 47	11,424 57	3,803 55	5,336 49	6,400 52	1,128 27

a 13 months' operation. *e* 17 months' operation. *i* 6 months' operation.
b 3 months under steam. *f* 3 " " *j* 4 " "
c 4 months' operation. 2 " " *k* 2 years' "
d 4 " " *h* 11 " "

l Domestic and Commercial Revenue combined under heading of Domestic Lighting.

m Sub Station Maintenance included.

n Includes maintenance and operation of steam plant for 3 months.

o General Officers' salaries included in General Expense.

p Motor repairs at Guelph.

"C"—Concluded

Electric Departments of Hydro Municipalities

December 31st, 1913

Baden	*g* Stayner	*h* Caledonia	Coldwater	Pt. Stanley	*i* Elmvale	Waterdown	*j* Rockwood	*k* Beachville	Pt. Credit
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
884 11	158 48	404 60	735 68	1,828 66	631 65	1,164 29	230 27	562 97	1,963 22
l	116 91	*l*	*l*	1,771 70	*l*	*l*	*l*	*l*	*l*
2,242 77	301 86	470 34	247 19	2,418 00	....	917 63	480 82	5,993 81	848 59
830 95	35 00	584 00	532 00	2,199 50	302 00	435 00	196 00	206 03	696 00
....	....	....	....	....	....	....	....	....	....
3,957 83	612 25	1,458 94	1,514 87	8,217 86	933 65	2,516 94	907 09	6,762 21	3,507 81
2,807 04	187 52	712 46	535 86	3,506 43	506 33	988 00	237 50	4,221 68	1,210 65
....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....
28 84	....	23 05	76 08	354 49	7 86	183 71	....	130 71	22 21
....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....
....	....	....	32 92	....	....	35 31	....	....	121 27
....	....	....	....	....	....	....	....	....	....
....	....	....	....	292 81	....	....	44 46	....	....
....	....	....	....	....	....	....	....	....	....
267 45	14 48	48 28	....	368 47	75 12	213 14	....	249 50	171 82
....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	127 62	....
....	....	....	....	....	....	....	75 99	....	....
q 325 26	*q* 340 82	*q* 328 09	*q* 455 36	*q* 1,188 91	*t* 299 76	*q* 521 56	*t* 150 00	*q* 518 86	*q* 534 23
277 00	....	250 00	375 00	617 75	....	365 00	....	525 00	446 00
3,705 59	542 82	1,361 88	1,475 22	6,328 86	889 07	2,306 72	507 95	5,773 37	2,506 18
252 24	69 43	97 06	39 65	1,889 00	44 58	210 22	399 14	988 84	1,001 63
....	....	....	....	....	....	....	....	....	....
3,957 83	612 25	1,458 94	1,514 87	8,217 86	933 65	2,516 94	907 09	6,762 21	3,507 81

q Includes Debenture interest and principal.

r No depreciation included — 15 year debentures and large investment in hydraulic development.

s Debentures not sold—no allowance.

t Proportion of fixed charges only.

u Debentures not sold—interest on advance and loan.

v Bad debts written off.

w Books have not been closed. Figures subject to change on final audit.

STATEMENT "D"

Report showing comparative revenue and number of consumers in municipalities where Hydro Power has been in use for two years or more.

—	—	Revenues.				Consumers		
		Domestic Lt.	Commercial Lt.	Power	Street Lt.	Domestic	Commercial	Power
		$ c.	$ c.	$ c.	$ c.			
Toronto	1912	201,554 74	*	225,451 55	275,666 23	11,441	*	518
	1913	185,797 67	231,255 72	369,128 37	344,933 79	16,519	4,764	1,037
Ottawa	1912	62,598 18	51,365 91	25,299 94	40,970 21	5,390	440	90
	1913	68,032 27	53,438 04	26,978 76	43,199 56	5,766	818	152
London	1912	28,196 62	28,527 44	52,633 00	29,270 00	3,851	792	158
	1913	41,932 42	39,256 07	79,758 96	28,372 00	5,201	1,007	198
Berlin	1912	14,585 02	19,080 82	28,654 23	12,387 63	1,022	422	105
	1913	15,291 37	19,548 91	35,655 90	16,155 75	1,291	470	127
St. Thomas	1912	7,596 01	18,741 74	14,761 30	12,208 30	620	300	60
	1913	11,125 50	16,097 41	36,550 26	10,989 72	951	329	70
Guelph	1912	10,251 87	16,400 57	30,139 00	11,000 00	960	345	73
	1913	11,528 07	15,075 61	42,091 34	9,500 04	1,260	400	85
Stratford	1912	6,942 56	14,661 16	8,834 40	12,120 00	640	316	76
	1913	11,550 71	17,072 61	14,272 59	12,120 00	1,042	367	92
Galt	1912	8,183 69	9,732 86	10,042 59	5,000 70	830	250	47
	1913	10,535 38	11,648 49	16,575 61	6,280 25	1,122	353	65
Woodstock	1912	4,914 92	13,316 02	21,087 61	5,400 00	464	265	43
	1913	6,495 02	12,942 32	20,262 52	7,160 00	636	282	55
Ingersoll	1912	3,073 73	6,648 28	14,430 66	3,000 00	220	142	38
	1913	3,595 03	6,048 51	15,293 44	4,262 03	278	170	44
Midland	1912	11,756 10	*	3,188 03	3,777 65	420	165	18
	1913	12,199 27	*	3,700 22	3,463 07	491	172	25
Waterloo	1912	4,057 46	4,524 93	11,545 93	4,538 82	239	112	35
	1913	4,263 66	5,098 42	14,970 14	4,905 77	321	125	44
Preston	1912	4,234 68	5,237 99	15,478 14	2,585 00	341	131	21
	1913	5,477 10	5,366 77	21,017 68	2,594 55	526	151	28
Penetang	1912	1,676 26	3,836 30	2,207 51	1,962 00	101	87	13
	1913	1,989 80	4,511 16	8,775 95	2,042 00	128	91	15
St. Mary's	1912	9,036 36	*	6,001 30	3,449 50	240	143	20
	1913	8,369 50	*	8,221 72	3,582 00	396	160	29
Brampton	1912	3,004 66	2,893 74	3,531 34	3,500 00	409	104	12
	1913	5,617 61	3,986 65	10,557 72	3,500 00	643	138	16
Tillsonburg	1912	3,233 92	3,350 91	3,283 75	3,073 50	200	128	6
	1913	2,796 57	4,677 38	4,763 15	2,601 00	254	143	17
Weston	1912	4,729 81	*	1,674 28	1,788 00	225	15	4
	1913	5,272 04	*	5,178 54	2,052 00	360	34	6
Mitchell	1912	2,964 48	2,977 08	4,597 03	1,375 00	159	79	13
	1913	2,362 52	2,813 92	6,160 53	1,675 00	179	85	16
New Hamburg	1912	1,195 08	1,423 35	3,369 05	1,627 00	124	63	5
	1913	1,589 21	1,890 72	5,792 20	1,827 00	142	63	8
Norwich	1912	862 17	674 48	263 93	591 00	128	64	2
	1913	1,926 78	1,162 98	1,978 55	1,285 50	166	76	3
Pt. Stanley	1912	897 02	1,106 63	1,314 70	1,545 10	122	40	3
	1913	1,828 06	1,771 70	2,418 00	2,199 50	182	60	9
Waterdown	1912	1,014 40	*	614 42	375 83	41	20	2
	1913	1,164 29	*	917 65	435 00	70	34	2

* Denotes that Domestic and Commercial lighting figures have not been separated, the figures shown being the total of the two.

STATEMENT "E"

Street light installation in cities, towns and incorporated villages, total cost per yearr, cost per lamp and cost per capita during the year 1913:—

—	Estimated populaion	Street Lt. Revenue	Installation		Cost per Arc per year	Cost per Incandescent per year	Cost per capita per year
			No. of Arcs	No. of Incandescents			
		$ c.			$ c.	$ c.	c.
Toronto	435,000	344,933 79	......	38200–	....	100w. 9 00	.80
Ottawa.........	95,600	43,199 57	690	2460orna. 186–100w.	45 00	100w. 6 83 100w. 10 00	.45
London	52,000	28,372 20	......	2868	....	75w. 11 00 100w. 12 85	.54
St. Thomas.....	17,000	10,989 72	44	1200	55 00	9 00	.64
Port Arthur	15,600	14,709 41	......	2147	....	60w. 5 00 100w. 8 30	.94
Berlin..........	17,500	16,057 40	......	1756–100w.	....	100w. 9 11	.91
Guelph	16,319	9,500 04	......	1000–100w.	....	100w. 9 50	.59
tratford.......	16,000	12,120 00	......	600–100w.	....	20 00	.76
Galt	11,800	6,280 25	......	901–100w.	....	100w. 9 50	.54
Woodstock	10,154	7,160 00	......	38–250w. 655–100w.	....	250w. 25 00 100w. 10 00	.70
Collingwood.....	7,600	3,802 84	......	385	....	12 00	.50
Ingersoll	5,149	4,262 03	......	323	....	80w. 12 50 60w. 12 00	.82
Midland	6,200	3,463 07	16	220	50 00	100w. 13 50	.52
Waterloo	7,000	4,877 64	......	546	....	100w. 10 00 60w. 9 00	.70
Preston	4,982	2,594 55	......	234	....	100w. 12 00 50w. 11 00	.52
Penetang	3,701	2,042 00	......	161	....	100w. 12 00	.55
St. Mary's	4,000	3,582 00	47	48	65 00	75w. 13 00	.90
Brampton	5,000	3,500 00	......	500	....	7 00	.70
Tillsonburg.....	2,976	2,601 00	......	223	....	60w. 11 00	.87
Hespeler	3,089	1,500 00	......	120	....	100w. 12 50	.50
Seaforth........	1,900	1,815 81	......	116	....	75w. 15 00 60w. 12 00	.95
Weston.........	2,300	2,052 00	......	171	....	100w. 12 00	.90
Milton	2,000	1,200 00	......	150	....	100w. 8 00	.60
Mitchell	2,000	1,675 00	......	87	....	100w. 13 80	.84
Acton	1,750	1,000 00	......	147	....	100w. 12 00	.58
New Homburg ..	1,624	1,827 00	......	200	....	100w. 9 00	1.13

MUNICIPAL RATES

The development of the present systems of charge for power and lighting service in the Municipalities is outlined in the report of 1912. This report also contains the Power Commission Act of 1912, which gives to the Commission the approval and control of all rates used by any Municipal Electrical Department for the supply of electrical power or lighting service.

Up to this time, some of the Municipalities had been using the first standard schedule as developed by the representatives of the Municipalities. Others were using rate schedules patterned after the Toronto system of charge. Then, again, others were using schedules of their own invention, or following previous practice. Among this last group there existed a great variety, consisting of flat rates, meter rates, and all combinations of these. Some of the rates used were more or less equitable, while others were not, being based on previous practice, local prejudice, or forced upon the Municipality by competition.

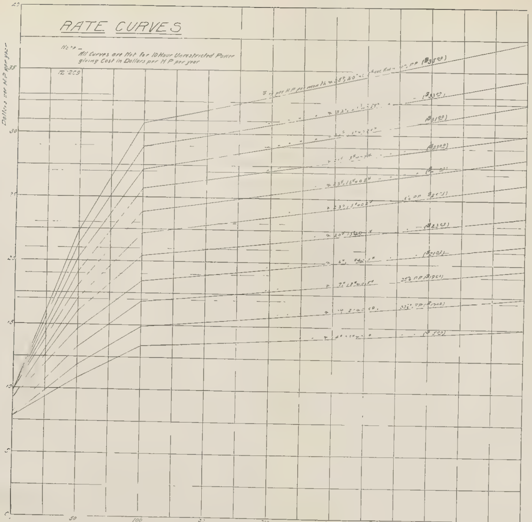
It was quite evident that unless a standard form of charge was used in all the Municipalities, there would be endless confusion and dissatisfaction.

In order that this standardization of rates could be worked out intelligently, a thorough study was made of the auditor's reports on the financial workings of the different Municipal Electrical Departments. From these reports, data was compiled showing the total capital invested in each of the following four Departments, viz.: Domestic Lighting, Commercial Lighting, Power and Street Lighting. It was also necessary to distribute between these four different Departments the different items of cost of operation, such as power, attendance, renewals and repairs, and the many other small items shown in the Standard System of Accounting. With all of this data it was possible to determine the approximate ratio between "service" or "demand" cost due to the fact that a service had been installed and a demand created, and the variable "consumption cost depending upon the use or non-use of power."

From this study resulted a standardized "service charge," and a variable "consumption charge," dependent upon the cost of power to the Municipality.

At the beginning of the year 1913, each Municipality taking power through the Commission was advised of the schedule of rates which were recommended for their use. In the majority of cases, these rates were adopted as recommended, since most of the Municipalities had co-operated in this study of rates, and had taken the various steps to reach the standard as recommended.

In some Municipalities, however, the recommended system of charge differed so greatly from that then in use, that a special investigation was necessary to demonstrate the advisability of making the change. In a number of cases, this called for a tabulation of the consumption of all of the users of one or more classes of power or lighting within the Municipality, to compare the results with the cost of service and with the results as they would have been had the recommended rates been in service. These investigations in one or two Municipalities have been difficult and the determination of the rate is still pending, but at the end of this fiscal year we can see our way clear to the adoption by all of the Municipalities securing power from the Commission of a standard system of charge which it is believed is just to all users, and fair to the Municipality, tending to the economy of use, and also encouraging a broader use of electricity.



RATE CURVES
Note –
All Curves are Net for 10 Hour Unrestricted Power giving Cost in Dollars per H P per year
Dollars per H P per year
($35.00)
($33.00)
($31.00)
($23.00)
50
100

No. . . . .

NAME . . . . Dated. . . . . .191. . . .

APPLICATION FOR ELECTRIC POWER SERVICE

THE UNDERSIGNED, hereinafter called the Consumer, hereby requests the . . . ., hereinafter called the Corporation, to make the necessary service connections and furnish electrical energy at the premises. . . . ., owned by . . . . and occupied by . . . . as a . . . . The electrical energy is required to operate . . . . of. . . . . .total horse-power capacity. Maximum demand kilowatts. . . . .

The Consumer and the Corporation agree to abide by the "Conditions" on the reverse hereof and to hold this Application as a contract when signed by the Consumer and accepted by the. . . . .

The Consumer further agrees to (1) to take from the Corporation all the electrical energy required by Consumer for power purposes for a term of one year from the date hereon and to pay monthly for such energy and service in accordance with the rates on the reverse hereof under Class. . . . . (2) to commence payments within one month from the date of connection.

SIGNED . . . . Consumer.

ACCEPTED FOR THE CORPORATION BY . . . .

DATE. . . . . .191. . . .

Connected Load. .Horse-power. Date Connected. .191. . . .

Maximum Demand. .Kilowatts. " Meter Installed. . . . . .191. . . .No. . . . .

RATES AND DISCOUNTS

SERVICE CHARGE—$1.00 per month per h.p. of Connected Load or Maximum demand.

CONSUMPTION CHARGE—Up to the first 50 hours' monthly use of Load . . . . .c. per kw-hr.
Additional consumption up to the second 50 hours' use . . . . .c. per kw-hr.
Remaining consumption - - - - - . . . . .c. per kw-hr.

DISCOUNTS—Class "A," 24 hour unrestricted use; No class discount.
" "B," 24 " restricted " 10% off above rate.
" "C," 10 " unrestricted " 10% " " "
" "D," 10 " restricted " 33⅓% " " "

Less. . . . . .% on whole Bill if paid within 10 days from date of Bill.

RESTRICTED HOURS.

Oct. 15th—Oct. 31st. .	5.30 p.m.	6.30 p.m.
Nov. 1st—Nov. 30th. .	5.00 "	6.30 "
Dec. 1st—Jan. 15th. .	4.30 "	6.30 "
Jan. 16th—Feb. 15th. .	5.00 "	6.30 "
Feb. 16th—Mar. 1st. .	5.30 "	6.30 "

CONDITIONS

1. The Consumer agrees to provide convenient and safe space for the Corporation's meters (for which no rental charges will be made), wires and all other appliances in said premises, and further agrees that no one who is not an agent of the Corporation or otherwise lawfully entitled to do so, shall be permitted to remove, inspect or tamper with the same, and that the properly authorized agents of the Corporation shall, at all reasonable hours, have free access to the said premises for the purpose of reading, examining, repairing or removing their said meters. wires and other material and appliances.

2. Meters and all other appliances of the Corporation in said premises shall be in the care and in the risk of the Consumer, and if destroyed or damaged by fire, or any cause whatsoever, other than ordinary wear and tear, the Consumer shall pay to the Corporation the value of such meters and appliances, or the cost of repairing or replacing the same.

3. The Consumer hereby expressly authorizes and empowers the Corporation at its option to remove the meters and all other material and appliances installed at its expense and cut off the supply of electricity and terminate this agreement whenever any bills for said service are in arrears or upon violation by the Consumer of any of the terms and conditions of this agreement.

4. The Corporation agrees to use reasonable diligence in providing a regular and uninterrupted supply of electricity, but does not guarantee a constant supply of electricity, and will not be liable in damages to the Consumer for failure to supply electricity to said premises.

5. This agreement shall not be binding upon the Corporation until accepted by it through its proper officer, and shall not be modified or affected by any promise, agreement or representation by any agent or employee of the Corporation unless incorporated in writing into this agreement before such acceptance.

6. The Consumer agrees that on request of Corporation, he will deposit with the Corporation the sum of . . . . .dollars to be held by Corporation as a guarantee that Consumer will fulfil all the terms of this agreement.

7. The Conshumer will provide all lines on the premises and all lines connecting premises with the point of delivery, and maintain the same in efficient condition with proper devices, the whole according to the requirements of the Rules and Regulations of the Hydro-Electric Power Commission of Ontario.

8. This agreement shall continue in force after the term herein mentioned from year to year until terminated by a notice in writing, given by either party hereto at least one month before the end of the term or any yearly term thereafter.

9. It is agreed that the signatures of the parties hereto shall be binding upon their successors or assigns, and that the vacating of the premises herein named shall not release the consumer from this agreement, except at the option and by written consent of the Corporation.

10. If required to fix the basis of billing, the Consumer hereby authorizes the Corporation to instal and repair maximum demand or curve-drawing meters or other measuring devices at Consumer's expense, or to make tests from time to time to determine the maximum amount of power used. The Consumer agrees not to make any changes in or additions to his apparatus or connected load after the same has been so determined, except with the written consent of the Corporation.

11. All electrical and mechanical equipment used by the Consumer shall be subject to the reasonable approval of the Corporation, and the Consumer shall so take and use the electrical energy as not to endanger the apparatus of the Corporation or cause any wide or abnormal fluctuation of its line voltage. All motors shall be selected with reference to securing the highest feasible power factor at all loads. Minimum power factor when operating Consumer's maximum load shall be 80 per cent. for motors up to 10 H. P. and 85 per cent above 10 H. P.

NAME ....Residence Class 1   No................

Commercial " 2   Dated................191....

APPLICATION FOR ELECTRIC LIGHTING SERVICE.

THE UNDERSIGNED, hereinafter called the Consumer, hereby requests the ...., hereinafter called the Corporation, to make the necessary service connections and furnish electrical energy at the premises ....within the .... of ...., owned by ....and occupied by .... as a .... The electrical energy is required to operate .... Total connected kilowatts .... Maximum demand kilowatts. ....

The Consumer and the Corporation agree to abide by the "Conditions" on reverse hereof and to hold this Application as a contract when signed by the Consumer and accepted by the ....

The Consumer further agrees to (1) take from the Corporation all the electrical energy required by Consumer for lighting the above premises for a term of one year from date hereof and to pay monthly for such energy and service in accordance with rates on the reverse hereof under Class .... (2) to commence payments within one month from the date of connection.

SIGNED .... ACCEPTED FOR THE CORPORATION BY ....

DATE ....191....

Floor Area—Net..............Sq. Ft.   Date Connected ....191....

Installed Capacity.............Watts.   " Meter Installed ....191.....No......

RATES AND DISCOUNTS.

CLASS 1—RESIDENCE LIGHTING—A Service charge of 4c. per month per 100 sq. ft. of floor area, plus a Consumption charge of ....c. per Kilowatt Hour kw-hr.

CLASS 2—COMMERCIAL LIGHTING—For Stores, Theatres, Factories, Hotels, Offices, etc. Consumption charge of ....c. per kw-hr. for first 30 hours' monthly use of installed capacity, and ....c. for each kw-hr. above.

DISCOUNTS—Less ....% on whole Bill if paid within .... days from date of Bill.

CONDITIONS.

1. The Consumer agrees to provide convenient and safe space for the Corporation's meters (for which no rental charges will be made), wires and all other appliances in said premises, and further agrees that no one who is not an agent of the Corporation or otherwise lawfully entitled to do so, shall be permitted to remove, inspect or tamper with the same, and that the properly authorized agents of the Corporation shall, at all reasonable hours, have free access to the said premises for the purpose of reading, examining, repairing or removing their said meters, wires and other material and appliances.

2. Meters and all other appliances of the Corporation, in said premises shall be in the care and in the risk of the Consumer, and if destroyed or damaged by fire, or any cause whatsoever, other than ordinary wear and tear, the Consumer shall pay to the Corporation the value of such meters and appliances, or the cost of repairing or replacing the same.

3. The Consumer hereby expressly authorizes and empowers the Corporation at its option to remove the meters and all other material and appliances installed at its expense and cut off the supply of electricity and terminate this agreement whenever any bills for said service are in arrears or upon violation by the Consumer of any of the terms and conditions of this agreement.

4. The Corporation agrees to use reasonable diligence in providing a regular and uninterrupted supply of electricity, but does not guarantee a constant supply of electricity, and will not be liable in damages to the Con umer for failure to supply electricity to said premises.

5. This agreement shall not be binding upon the Corporation until accepted by it through its proper officer, and shall not be modified or affected by any promise, agreement or representation by any agent or employee of the Corporation unless incorporated in writing into this agreement before such acceptance.

6. The Consumer agrees that on request of Corporation, he will deposit with the Corporation the sum of............dollars to be held by Corporation as a guarantee that Consumer will fulfil all the terms of this agreement.

7. The Consumer will provide all lines on the premises and all lines connecting premises with the point of delivery, and maintain the same in efficient condition with proper devices, the whole according to the requirements of the Rules and Regulations of the Hydro-Electric Power Commission of Ontario.

8. This agreement shall continue in force after the term herein mentioned from year to year until terminated by a notice in writing, given by either party hereto at least one month before the end of the term or any yearly term thereafter.

9. It is agreed that the signatures of the parties hereto shall be binding upon their successors or assigns, and that the vacating of the premises herein named shall not release the Consumer from this agreement, except at the option and by written consent of the Corporation.

Municipality	Cost of Power to Municipality per h.p. per year 1912	Cost of Power to Municipality per h.p. per year 1913	Base Power Rates 1912 Flat Rates 1st h.p. per h.p. per year	Base Power Rates 1912 Flat Rates All additional per h.p. per year	Base Power Rates 1912 Differential Rates 1st h.p. per h.p. per month	Base Power Rates 1912 Differential Rates All additional h.p. per month	Base Power Rates 1912 Differential Rates 1st 50 hr per month per kw-hr	Base Power Rates 1912 Differential Rates 2nd 50 hr per month per kw-hr	Base Power Rates 1912 Differential Rates All additional per kw-hr	Base Power Rates 1912 Prompt Payment Discount	Base Power Rates 1913 Service charge per h.p. per month	Base Power Rates 1913 1st 50 hr per month per kw-hr	Base Power Rates 1913 2nd 50 hr. per month per kw-hr.	Base Power Rates 1913 All additional per kw-hr	Base Power Rates 1913 Prompt Payment Discount	Lighting Rates 1912 Domestic Per 100 sq. ft.	Lighting Rates 1912 Domestic Per kw-hr	Lighting Rates 1912 Commercial 1st 30 hr. per month per kw-hr	Lighting Rates 1912 Commercial All additional per kw-hr	Lighting Rates 1912 Commercial Prompt Payment Discount	Lighting Rates 1913 Domestic Per 100 sq. ft.	Lighting Rates 1913 Domestic Per kw-hr	Lighting Rates 1913 Commercial 1st 30 hr. per month per kw-hr.	Lighting Rates 1913 Commercial All additional per kw-hr	Lighting Rates 1913 Prompt Payment Discounts	Street Lighting 1912	Street Lighting 1913
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	c.	c.	c.	%	$ c.	c.	c.	c.	%	c.	c.	c.	c.	c.	c.	c.	c.	c.	%		
Acton		36 00				See Note A					1 00	4.3	2.9	0.4	10						4	5	10	5	10		$8.15 per 100 w. lamp
Baden	36 95	37 00			1 35	1 00	4.5	3.0	0.4	10	1 00	4.2	2.8	0.3	10	4	5	12	5	10	4	5	10	5	10	$13.50 per 100 w. lamp	$13.80 per 100 w. lamp
Barrie		33 70				See Note A					1 00	3.6	2.4	0.3	10						4	4.5	9	4.5	10		$45.00 per Arc, $20 per 100 w. lamp
Beachville	33 89	31 00			1 35	1 00	3.9	2.6	0.3	10	1 00	3.9	2.6	0.3	10	4	5	12	5	10	4	5	10	5	10		
Berlin	25 00	22 50			First Standard Schedule 10% local discount					10	1 00	2.5	1.7	0.2	10	3	4	12	3	10 & 10	4	4	8	4	20	$9.65 per 100 w. lamp	$9.00 per 100 w. lamp
Brampton	29 00	25 00	45 00	39 00	1 35	1 00	3.3	2.2	0.3	10	1 00	3	2	0.25	10		6	6	6	20	4	3	6	3	10		$7.00 per 100 w. lamp
Caledonia	29 10	29 10			1 35	1 00	3.7	2.5	0.3	10	1.00	3.7	2.5	0.3	10	4	4	10	4	10	4	4	8	4	10		
Coldwater		28 00				See Note A					1 00	3.2	2.1	0.3	10						4	4	8	4	10		
Collingwood		33 97				See Note A					1 00	3.6	2.4	0.3	10						4	4.5	9	4.5	10		
Dundas	17 00	16 00			First Standard Schedule 33⅓% local discount					10	1 00	1.6	1.1	0.15	15	4	3.5	10	3.5	10	4	3	6c. 1st 25 hr. 3c. next 75 hr.	0.15	10		
Elmira						See Note B					1 00	4.7	3.1	0.4	10						4	5	10	5	10		
Elmvale		31 00				" A					1 00	3.6	2.4	0.3	10						4	4.5	9	4.5	10		$12.00 per 100 w. lamp
Galt	25 00	22 00			First Standard Schedule 10% local discount					25	1 00	2.3	1.6	0.2	25	4	4	12	4	25	4	4	8	4	25	$5,000 00 total	$9.50 per 75 w. lamp
Georgetown		36 00				See Note A					1 00	4.3	2.9	0.4	10						4	5	10	5	10		
Guelph	25 00	22 00				Special Schedule					1 00	2.3	1.6	0.2	25		8	8	8	Net	4	4	8	4	20	$11.00 per 100 w. lamp	$9.50 per 100 w. lamp
Hagersville		33 21				See Note A					1 00	3.9	2.6	0.3	10						4	4.5	9	4.5	10		
Hamilton	17 00	16 00				Special Schedule				10	1 00	2.1	1.4	0.2	25 & 10	4	3	8	3	10	4	3	6c. 1st 25 hr. 3c. next 75 hr.	0.2	20		$18.00 per 100 w. lamp
Hespeler	26 00	23 00			First Standard Schedule no local discount					10	1 00	3	2	0.25	10		10	10	10	10	4	4.5	10	10	10	$15.00 per 40 w. lamp	$12.00 per 100 w. lamp
Ingersoll	28 00	25 50			" " " "					10	1 00	3.3	2.0	0.3	10		10	10	10	10	4	4.5	9	4.5	10	$10.91 per 80 w. or 100 w. lamp	$12.00 per 80 w. lamp, $12.50 per 100 w. lamp
London	28 00	24 00			" " 10% " "					10	First Standard Schedule 10% local discount				10		5	5	5	10		5	5	5	10		$8.00 per 75 w. lamp, $11.00 per 100 w. series, $12.85 per 100 w. multiple lamp
Mimico	30 74	30 00			1 35	1 00	3.6	2.4	0.3	10	1 00	3.6	2.4	0.3	10	4	4.5	12	4.5		4	4	9	4.5	10		$12.00 per 100 w. lamp
Milton		28 00				See Note A					1 00	3.1	2.1	0.3	10						4	4	8	4	10		$6.66 per 100 w. lamp (approx.)
Midland	21 00	20 30	40 20	32 64	1 35	1 00	2.25	1.5	0.75	10	1 00	1.7	1.1	0.15	10	4	4	12	4	10	4	4	8	4	20	$13.50 per 80 w., $11 per 60 w. lamp, $50 per Arc	$13.50 per 80 w., $11 per 60 w. lamp, $50 per Arc
Mitchell	33 00	37 00			First Standard Schedule no local discount					10	1 00	4.5	3.1	0.4	10		Special Rates 70c. per mo. minimum					Special rates 70c. per. mo. minimum.				$20.00 per 100 w. lamp	$13.80 per 100 w. lamp
New Hamburg	32 00	32 00			" "					10	1 00	4.2	2.8	0.3	10		10	10	10	10	4	5	10	5	10	$7.00 per 100 w. lamp, and renewals	$9.00 per 100 w. lamp, and renewals
New Toronto						See Note B					1 00	3	2	0.25	10						4	4	8	4	10		
Norwich	30 00	32 00			1 35	1 00	3.5	2.3	0.3	10	1 00	3.5	2.3	0.3	10	4	4 10	12 10	4 10	10 10	4	4	12	4	10		$12.00 per 100 w. lamp, $9.00 per 60 w. lamp
Ottawa	15 00	15 00				Special Schedule						Special Schedule						Special Schedule					Special schedule			$45.00 per Arc	$45.00 per Arc, $10.00 per 100 w. lamp
Penetang	25 80	26 50	40 20	32 64	1 35	1 00	2.25	1.5	0.75	10	1 00	1.7	1.1	0.15	10	4	5	12	5	10	4	4	8	4	10	$12.00 per 80 w. lamp	$12.00 per 80 w. lamp
Petersburg		Served by Baden				See Note A					1 00	5.1	3.4	0.4	10						4	6	12	6	10		
Port Arthur	20 30	19 50	Special Schedule		1 30	1 00	2.25	1.75	1			Same as 1912				4	3.5	8	3.5	10	4	3.5	8	3.5	10	$5.00 per 60 w., $8.30 per 100 w. lamp.	$5.60 per 60 w., $8.30 per 100 w. lamp
Port Credit	36 79	31 00			1 35	1 00	3.7	2.4	0.3	10	1 00	3.7	2.4	0.3	10	4	4.5	12	4.5	10	4	4.5	9	4.5	10		$12.00 per 100 w. lamp
Port Dalhousie		22 30				See Note A					1 00	2.1	1.4	0.3	10						4	3	6 Also Flat Rates	3	10		
Port Robinson		Served by Welland				" A					1 00	1.8	1.2	0.15	10						4	3	6	3	10		
Port Stanley	34 75	35 50			1 35	1 00	5.5	3.7	0.5	10	1 00	5.5	3.7	0.5	10	4	5	12	5	10	4	5	10	5	10		
Preston	25 00	21 50			First Standard Schedule 10% local discount					10	1 00	2.3	1.6	0.2	10	4	4.5	12	4.5	10	4	4	8	4	10	$18.00 per 100 w. lamp	$18.00 per 100 w. lamp
Rockwood		38 00				See Note A					1 00	4.7	3.1	0.4	10						4	5.5	11	5.5	10	$12.00 per 40 w. or 80 w. lamp	$11.00 per 60 w. lamp, $12.00 per 80 w. lamp
Seaforth	41 00	40 00	56 00	46 75	1 35	1 00	4.4	2.5	1.25	10	1 00	4.9	3.3	0.4	10		10	10	10	5 to 20	4	5	10	5	10		$15.00 per 100 w. lamp, $12.00 per 75 w. lamp
Sebringville		Served by Stratford.				See Note A					1 00	5.4	3.6	0.4	10						4	5	10	5	10		
St. Agatha		Served by Baden				" A					1 00	5.1	3.4	0.4	10						4	6	12	6	10		
Stayner						" B					1 00	4.7	3.1	0.4	10						4	5	10	5	10		
St. Mary's	38 00	29 50			First Standard Schedule no local discount					10	1 00	3.6	2.4	0.3	10	4	6	12	7	10	4	5	10	5	10		
St. Thomas	32 00	29 00			" " " "					10	1 00	3.3	2.0	0.3	10	3	5	12	5	10	4	4	8	4	10	$13.00 per 100 w. lamp $65.00 per Arc	$13.00 per 100 w. lamp, $65.00 per Arc.
Stratford	32 00	30 00			" " " "					10	1 00	3.6	2.4	0.3	10	4	4.5	12	4.5	10	4	4.5	9	4.5	10	$11.40 per 50 w., $12.75 per 75 w. lamp, $55 Arc.	$9 per 50 w., $10 per 75 w. lamp, $55 per Arc
Tillsonburg	32 00	32 00	50 00	40 00	1 35	1 00	3	2	1	10	1 00	3.8	2.5	0.3	10	4	5	12	5	10	4	5	10	5	10	$12.00 per 75 w. lamp	$10.00 per 75 w. lamp
Toronto	18 50	15 00			1 35	1 00	1.5	1	0.5	10		Same as 1912				4	3	8	3	10	4	3	8	3	10	$13.50 per 60 w. lamp	$11.00 per 60 w. lamp
Waterdown	37 50	26 00			1 35	1 00	3.5	2.4	0.3	10	1 00	3.5	2.4	0.3	10	4	5	12	5	10	4	5	10	5	10	$9.00 per 100 w. lamp	$9.00 per 100 w. lamp
Waterloo	20 00	23 50			First Standard Schedule 10% local discount					10	1 00	2.5	1.7	0.2	10	4	4	12	4	10	4	4	8	4	20	$10.00 per 100 w. lamp.	$10.00 per 100 w. lamp
Welland		14 50				See Note A					1 00	1.8	1.2	0.16	25						4	3	6	3	25	$10.00 per 75 w. lamp, $9.00 per 60 w. lamp.	$10.00 per 75 w. lamp, $9.00 per 60 w. lamp
West Hamilton	...	Served by Dundas				" A					1 00	2.8	1.8	0.2	10						4	4	8	4	10		$18.00 per 250 w. lamp, $9.00 per 100 w. lamp
Weston	30 00	30 00			1 35	1 00	3.3	2.2	0.3	10	1 00	3.3	2.2	0.3	10		8	8	8	10	4	4	8	4	10		
Woodstock	26 00	23 00			First Standard Schedule 10% local discount					10	1 00	2.5	1.7	0.2	10	3	4	10	4	20	4	4	8	4	25	$12.00 per 100 w. lamp	$12.00 per 100 w. lamp $25 per 250 w. lamp, $10 per 100 w. or 60 w. lamp

NOTE A.—Service commenced during 1913
NOTE B.— " " " October 1913

FIRST STANDARD SCHEDULE: Base Rates for Power Service.

H.P. of Motors or Peak Load	1-3	4–10	11–25	26–50	51–100	101 up
Flat rate per h.p. per year, based on installed h.p. or maximum demand	$50	$48	$45	$43	$41	$40
Differential rates. Fixed charge per installed h.p. per year or maximum demand	$15.00	$14.40	$13.80	$13.20	$12.60	$12.00
Meter rate per kw-hr. of consumption	3.5c.	3.0c.	2.5c.	2.0c.	1.5c.	1.5c.

SPECIAL SCHEDULE; Base Rates for Power Service in Hamilton.

H.P. of motors or peak load	1-3	4–10	11–25	25–50	51–100	101 up
Flat rate per h.p. per year, based on installed h.p. or maximum demand	$37.50	$36.00	$33.75	$32.25	$30.75	$30.00
Differential rates, fixed charge per installed h.p. per year or maximum demand	$6.00	$6.40	$6.75	$7.50	$8.25	$9.00
Meter rate per kw-hr. of consumption	2.6c.	2.25c.	1.9c.	1.5c.	1.1c.	.95c.

Rates Recommended and in Use for Rural Power

District	Municipality Supplying the Power	Service Charge per Month	Power Charge		Prompt Payment Discount from Meter rate	Remarks
			Flat Rate per h.p. per year	Alternative Meter rate per kw-hr.		
Etobicoke Township	Mimico					Humber Bay District gets house Lighting service at 4c. per 100 sq. ft. and 5c. per kw-hr.
Grantham Township		$2.00	$22.00	4.5c.	10%	No service is being given but Contracts are being obtained.
Norwich, North "	Norwich	2.00	36.00	4		
Oxford, North "	Ingersoll	2.00	36.00			
Oxford, West "	Woodstock	3.00	30.00			
Sebringville	Stratford					See Table of Municipal rates.
Petersburg	Baden					" "
St. Agatha	Baden					" "
Toronto Township	Toronto Township	2.00	36.00			
Waterloo "	Preston	2.00	30.00	5	10	(No service being given but Contracts are being obtained).
West Hamilton	Dundas					See Table of Municipal rates.
Yarmouth Township	St. Thomas	3.00	36.00			
York "	Toronto					Districts close to City Limits served at Toronto rates

MUNICIPAL PURCHASES

An important branch of Municipal work is the purchase of material and apparatus for the maintenance and operation of existing lines in the substations, equipment and extensions, and the apparatus and material required for Municipal and Electrical Departments of the Province, and many of the Provincial Institutions.

The System and the Municipalities require yearly large quantities of material and apparatus. Appreciating that this could be purchased to best advantage through the Commission, buying from reliable sources, at wholesale prices, the Commission has for several years been acting in this capacity, and at the present time is purchasing for seventy-four Municipal Departments.

If the Municipalities will co-operate to an even greater extent, and place their yearly requirements through the Commission, notifying it in advance, arrangements can be made which will enable each Municipality to obtain Meters, Lamps, Transformers and all the various appliances and devices commonly used, at prices consistent with these arger quantities. The Commission already carries in stock in its storehouse in Toronto a supply of these various appliances and devices, and if the demand is sufficient, this stock will be enlarged to ensure prompt shipment of all of the various items generally used.

By notifying the Commission in advance, so that arrangements can be made for stock, the delays in shipping materials ordered at the last moment will be minimized.

The Commission has in operation a complete Laboratory equipment, which is continually examining, testing and standardizing, and in buying through the Commission, Municipalities obtain the benefit of this expert service, which acts as a check against the supply of inferior material.

The general work of the Engineering and Purchasing Staffs covers a wide field, ranging from the purchase and installation of the largest Electrical and Hydraulic apparatus for the equipment of power and lighting plants in various substations and municipalities, down to the minor supply items.

The services of this expert advice are offered to any of the Municipal Electrical Enterprises in the Province.

A summary of the more important purchases made for the Municipalities during 1913 is approximately as follows:

MUNICIPAL PURCHASES

—	Poles		Overhead Line and Street Lighting Material	Transformers		Carbon and Tungsten Lamps		Wattmeters		Switch Gear	General Supplies	Motor and Apparatus.	Miscellaneous	Total Value
	No.	Value		Kw.	Value	No.	Value	No.	Value					
		$ c.	$ c.		$ c.		$ c.		$ c.		$ c.		$ c.	$ c.
Acton	21	91 45	1,258 87	15	577 80	1,198	360 82	1	63 60		11 12		3 50	2,367 16
Baden			909 86	10	140 00	722	238 32	23	275 30		255 86		22 30	1,841 64
Bobcaygeon			384 42										1,000 00	1,384 42
Barrie						572	262 78						77 00	339 98
Beachville	2	36 00	261 56	20	200 00	394	104 75				30 00		10 00	642 31
Belleville Asylum								1	150 00					150 00
Beaverton	110	249 50	2,101 57											2,351 07
Berlin	12	99 00	414 85			9,102	3,665 02				9 00			4,187 87
Brampton	90	385 75	614 54			1,734	628 12	31	263 25					1,891 66
Brockville	119	257 00				575	192 62							449 62
Brantford			528 60			24	13 92							542 52
Caledonia	1	3 25	76 16	5	90 00			18	157 80				1 80	329 01
Cannington			523 83											523 83
Chesterville			2,316 50											2,316 50
Clarksons	151	750 00	3,053 69	20	690 00	300	96 00							4,589 69
Cooksville			51 75											51 75
Clinton	100	164 50	948 33			823	246 34							1,359 17
Coldwater			120 49	40	362 57	650	208 00	22	234 00		183 27			1,108 33
Collingwood			4,151 38			1,394	659 90				1 05			4,812 33
Cornwall						500	160 00							160 00
Dundas	205	592 55	3,586 94	20	195 54	1,250	182 50	217	1,813 60		151 07		121 88	6,744 08
Elmira	539	1,738 75	4,477 90	193½	1,735 18	468	180 78	49	572 15					8,704 76
Elmvale			662 29	35	275 00	672	224 74	100	628 50	64.80	1,221 96			3,077 29
Georgetown	323	721 25	842 26	189½	2,309 00	468	215 44	296	2,359 60		368 08		57 00	6,872 63
Galt			20 63			12,932	4,768 34	1	159 00		175 00		121 94	5,244 91
Goderich	115	143 75	4,255 49			2,034	643 73							5,042 96
Guelph			14 74	300	2,250 00	3,596	1,042 68							3,307 42
Hagersville			456 92	3	50 00	24	3 90	26	327 20					838 07
Hamilton						55,454	6,033 53							6,033 53
Hamilton Asylum						2,248	597 08							597 08
Hespeler						886	266 42							266 42
Ingersoll						350	65 50	1	245 00	2 27	33 00			345 87

Kincardine	......	......	346 46	15	210 00	100	27 00	......	......	......	......	......	......	583 46
London	350	1,386 00	20,978 42	127	860 30	13,518	11,103 26	470	4,818 00	......	444 00	......	11 90	39,601 88
London Asylum	......	......	......	......	......	1,470	441 61	......	......	......	......	......	......	441 61
Merritton	......	......	......	......	......	100	32 00	......	......	......	......	......	......	32 00
Markham	......	......	......	......	......	7,202	2,331 64	15	244 10	......	......	......	......	2,575 74
Milton	......	......	3,570 75	18	438 00	1,160	400 44	1	26 00	......	153 60	......	......	4,588 79
Midland	......	......	......	......	......	1,246	646 82	1	180 00	......	20 10	1,600	......	2,446 92
Mimico	367	959 50	4,284 36	174	1,523 04	1,918	689 82	131	1,332 35	......	13 00	......	......	8,802 07
Mitchell	......	......	......	......	......	670	239 56	......	......	......	......	......	......	239 56
Morrisburg	......	......	......	......	......	500	168 00	......	......	......	......	......	......	168 00
New Hamburg	......	......	......	......	......	1,494	434 24	......	......	......	50 50	......	6 80	491 54
New Toronto	165	642 00	250 25	10	140 00	......	......	......	......	......	......	......	......	1,032 25
Norwich	75	187 25	2,145 75	4	180 00	868	273 22	......	......	......	......	270 50	......	3,056 72
Ottawa	......	......	......	......	......	5,840	2,898 16	......	......	......	......	200 00	......	3,098 16
Paris	......	......	......	......	......	1,672	625 54	......	......	......	......	......	......	625 54
Penetang	......	......	2,270 92	70	584 65	300	283 50	42	860 50	......	100 80	......	......	4,100 37
Peterboro	......	......	3,120 34	30	300 00	......	......	......	......	......	......	......	......	3,420 34
Petersburg	8	72 00	292 64	25	341 87	......	......	......	......	......	......	......	......	706 51
Port Arthur	......	......	4,797 87	......	......	14,914	6,214 92	......	......	......	......	......	......	11,012 79
Port Credit	188	503 75	2,345 52	48	880 00	424	429 92	56	498 65	......	61 38	......	......	4,719 22
Port Stanley	......	......	259 44	......	......	292	126 72	......	......	......	......	......	......	386 16
Preston	......	......	4,999 90	3	76 00	4,618	1,482 52	4	214 68	......	127 74	......	13 75	6,914 59
Prescott	......	......	3,257 74	......	......	200	65 00	......	......	......	1 50	......	......	3,324 24
Rockwood	2	11 20	490 05	......	......	249	80 05	12	103 65	......	34 32	......	......	719 27
Seaforth	......	......	902 27	25	240 00	1,294	419 26	11	143 00	......	302 99	......	142 00	2,149 52
Stratford	......	......	351 79	15	210 00	8,110	2,264 08	51	440 00	......	254 22	......	......	3,518 09
St. Mary's	......	......	......	......	......	1,386	435 18	......	......	......	......	......	......	435 18
St. Thomas	88	366 10	961 65	6	100 00	1,050	197 50	......	......	......	25 00	......	410 00	2,061 25
Stayner	......	......	763 70	45	336 00	350	85 50	130	1,117 75	......	......	......	......	2,302 95
Streetsville	69	372 25	476 12	150	1,350 00	......	......	3	381 16	......	......	......	......	2,579 53
Thorndale	70	146 00	1,267 91	33	355 30	......	......	......	......	......	......	......	......	1,769 21
Thamesford	27	56 00	1,465 91	83	844 70	......	......	......	......	......	......	......	......	2,366 61
Tillsonburg	......	......	......	......	......	2,595	1,013 27	1	32 50	......	......	......	......	1,045 77
Toronto	......	......	......	......	......	12,108	7,070 44	......	......	......	......	......	......	7,070 44
Waterdown	......	......	344 38	1	40 00	174	62 18	25	212 70	......	......	......	......	659 26
Waterford	......	......	16 99	......	......	......	......	......	......	......	......	......	......	16 99
Waterloo	......	......	2 50	......	......	2,818	1,014 86	......	......	......	246 20	......	......	1,263 56
Welland	160	355 00	1,494 52	90	560 00	1,940	836 85	403	3,436 00	28.00	161 27	......	625 00	7,496 64
Weston	......	......	24 00	......	......	600	330 08	......	......	......	50	......	......	355 58
Winchester	187	676 00	2,770 01	110	1,152 00	......	......	......	......	......	......	......	......	4,598 01
Woodstock	10	125 00	148 36	......	......	3,748	1,550 20	2	43 00	......	42 32	......	317 00	2,225 88
Grand Total	3,554	11,090 80	96,434 14	1,933	19,596 95	154,230	65,434 57	2,144	21,333 04	95.07	4,478 85	2,070 50	2,042 07	223,475 99

MUNICIPAL ELECTRICAL INSPECTION

Early in the year 1913 proofs of the book of Rules and Regulations governing inside wiring were produced and submitted to engineering bodies, manufacturers, contractors, electrical workers and jobbers, as well as the Fire Underwriters. These bodies were requested to go carefully into the proposed regulations and submit any criticisms or possible objections to the Commission, in order that the adopted regulations would be thoroughly in keeping with local conditions, and not in any way cause unnecessary confusion or serious loss to the various interests affected by their enforcement. After sufficient time had been given to thoroughly consider the proposed rules and regulations, the criticisms were received.

The regulations follow closely along the lines of The National Electrical Code, which has been the adopted standard in Canadian and American practice, and the adopted regulations of the Fire Underwriters. In the regulations, the arrangement of the code has been altered and improved, and rules for the protection of life have been added which are not to be found in the National Code.

In addition to these rules and regulations, a complete by-law has been written and printed in pamphlet form. This by-law is for adoption by the various municipalities where inspectors are appointed, and will save the municipalities much confusion and loss of time, and also provide a uniform system of inspection.

In this by-law the inspectors' duties and authority are well defined, and a uniform scale of inspection fees has been compiled and included in the said by-law.

During the past few months, a large number of municipalities have been visited and the nature of the work explained to them for the purpose of assisting them in the selection and appointment of inspectors. Much valuable information has been imparted to these municipalities by these visits, and in a number of places appointments may be made at any time now .

The following municipalities have been visited, and in some cases revisited:—

Fort William
Toronto
Hamilton
London
Peterboro
Ottawa
Kingston
Port Arthur
Belleville
Port Hope
Cobourg
Oshawa
Oakville
St. Catharines
Port Dalhousie
Newcastle
Whitby
Lindsay
Bobcaygeon
Bowmanville
Niagara Falls
Welland
Georgetown
Preston
Galt
Berlin
Hespeler
Waterloo
Stratford
Clinton
Goderich
Collingwood
Seaforth

The city of Ottawa have appointed their inspectors, and the work is being carried out in a satisfactory manner, and it is expected that at any time appointments will be made in the cities of Toronto, Hamilton, London, Goderich, Peter-

boro', Berlin, and it has been arranged that the surrounding municipalities will be included in each case.

So far as the work of the Department is concerned, everything is in a satisfactory condition to carry out and supervise the general direction of the inspection systems, and it now rests with the municipalities to take advantage of the legislation enabling them to appoint inspectors for the purpose of enforcing the rules and regulations.

The general concensus of opinion among the electrical interests is that this regulation provides for a long-felt want, and that an effective system of inspection is welcomed by the electrical interests as a whole.

FAIR DEMONSTRATIONS

Dundas Exhibition—October 31st to November 2nd, 1912

A demonstration of electrical household appliances and motor-driven farm machines was made at Dundas on the evenings of Oct. 31st, Nov. 1st and the afternoon and evening of Nov. 2nd. The exhibit was held in a vacant store in the main street of the town, and was the centre of considerable interest for the three days during which it was open. Demonstrators were on hand to operate and explain the various uses of the appliances, and all farm machinery was shown in actual operation.

Women's Institute Convention—November 14th and 15th, 1912

Arrangements were made in November, at the request of the Department of Agriculture, for an exhibition of electrically-operated appliances at the annual convention of the Women's Institute, held in the Guild Hall, Young Women's Christian Association, Toronto.

Various appliances and machines, consisting of dairy machinery, vacuum cleaners, washing and sewing machines, electric fans, heating appliances, etc., were exhibited in operation, between the sessions of the convention, and three demonstrators were employed to explain the operation of the numerous articles which made up the display.

Collingwood Demonstration—April 24th to 28th, 1913

A request was received from the municipality of Collingwood late in January for an exhibition during the inauguration of power service on February 24th. Arrangements were accordingly made for an exhibition along the lines of previous demonstrations of this sort, consisting of an electrical kitchen with a collection of small utensils and a washing machine; a dining-room arranged with various table and buffet utensils, and a dairy room equipped with a cylinder churn, a butter worker and a cream separator, the whole display being designed to represent a cross-section view of a farmer's residence.

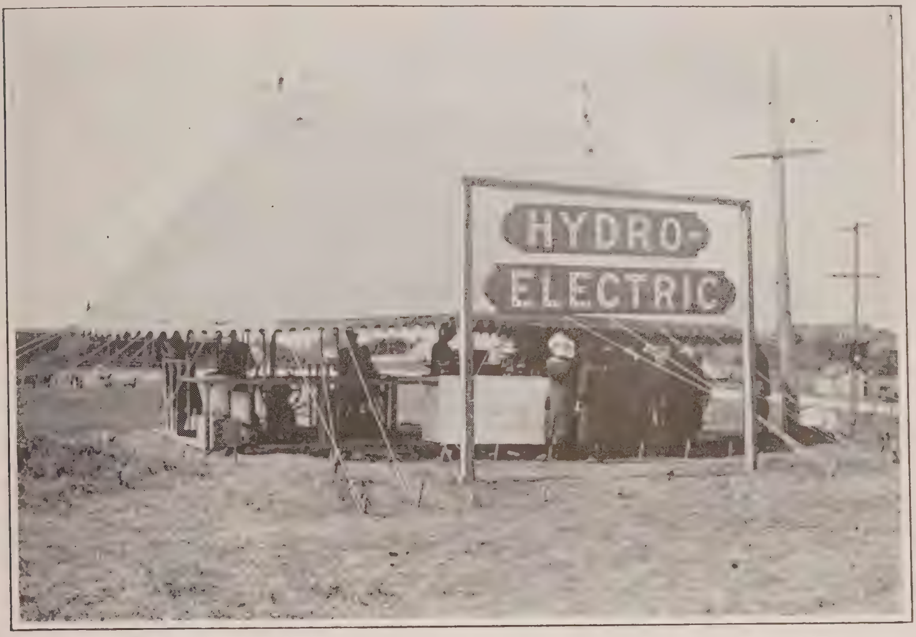
The farm had equipment that had been shown throughout the country, namely, a grinding mill, ensilage cutter, straw cutter, circular saw and pump, were shown in the fourth and last section.

The display which was made in a store in the business section of the town, was largely attended during the three days that it was open and meals were served on several occasions to the town officials and guests.

Barrie Demonstration—April 14th to 19th, 1913

Following the Collingwood demonstration, arrangements were made to ship the apparatus and appliances to Barrie for a display in the Opera House in that municipality. The stage here was arranged as a kitchen, dining-room and dairy, and a milking machine, grinder, ensilage cutter, force pump with pump jack, etc., arranged to demonstrate the various uses of electricity on the farm.

During the time that the exhibition was in progress, toast, coffee, biscuits, etc., were prepared on the electrical appliances and served by the demonstrator. The Honorable Mr. Beck addressed a large audience on the evening of the inauguration of the power service.



Renfrew Demonstration

Renfrew Demonstration

Seaforth Demonstration—June 27th, 1913

A small exhibit of electrically operated household appliances, an automatic water pump and milking machine was made at Seaforth on Rally Day, June 27th, 1913. The display, particularly the milking outfit, occasioned considerable interest, and was under the supervision of capable demonstrators.

Renfrew Fair—September 17th, 18th and 19th, 1913

A comprehensive display of electrically operated household appliances and motor-driven farm machines was shown at the Renfrew Fair on the 17th, 18th and 19th of September, 1913. The exhibition was housed under a large marquee tent in the Fair Grounds, and consisted of a complete dairy outfit, mechanical milking outfit, pump, grinder, saw and a representative complement of household appliances.

During the Fair eight cows were milked each day with the milking machine. The milk thus obtained was skimmed in a separator, and the cream used by the demonstrator for demonstrating purposes in connection with the household appliances.

Goderich Agricultural Exhibition—September 17th, 18th and 19th, 1913

Arrangements were made at the invitation of the Goderich Fair Association for a display of electrically operated household appliances and farm machines, at the Goderich Agricultural Exhibition, Sept. 17th to 19th, 1913. A milking machine and dairy outfit were shown at this Fair, in charge of a skilful demonstrator.

Fergus Fair—September 23rd and 24th, 1913

An exhibit of electrical household appliances was made at the South Wellington Fair, in Elmira, on September 23rd and 24th, 1913.

This display consisted of a representative collection of household appliances which were shown in actual operation, under the supervision of a competent demonstrator.

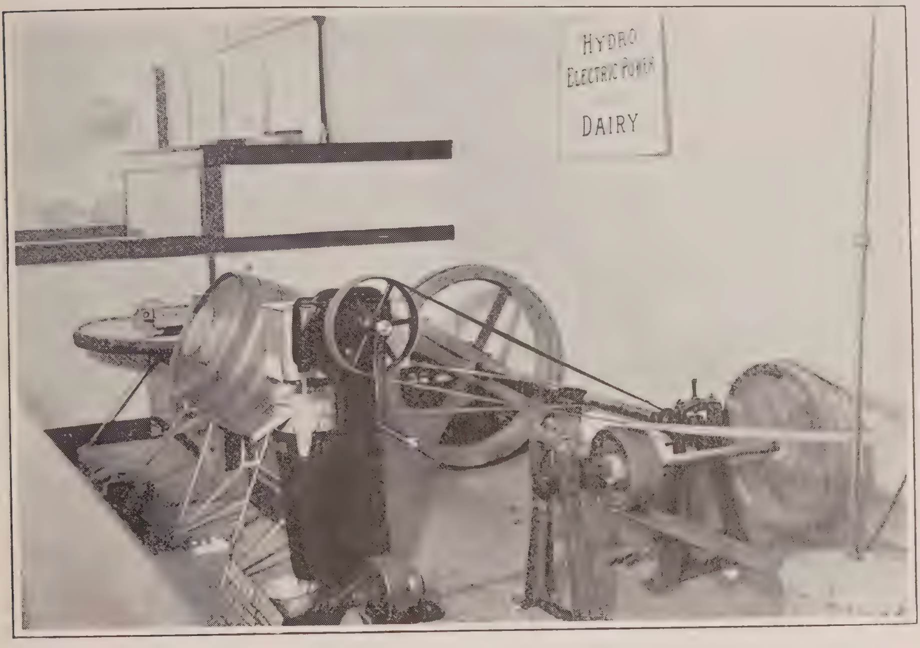
Prescott Fair—October 1st and 2nd, 1913

Arrangements were made in September to ship the exhibit used at the Renfrew Fair to Prescott, for a demonstration at the Prescott Fair, which was held on Oct. 1st and 2nd, 1913. Unfortunately the Fair was not a success, owing to inclement weather, and although the equipment was installed, there was not sufficient attendance to warrant its operation, and the exhibit was therefore removed and returned to Toronto.

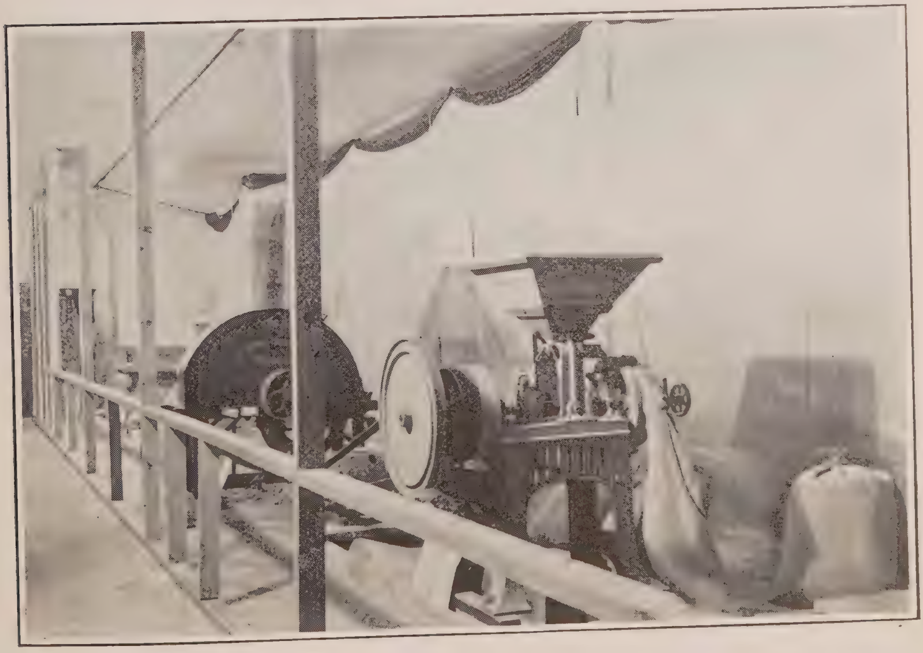
Coldwater Fair—September 29th and 30th, 1913

The Coldwater Fair Association solicited a demonstration of electrically operated household and farm appliances at the Coldwater Fair during the latter part of August, and arrangements made for a complete exhibit of electrical household appliances and motor-driven farm machines, consisting essentially of a complete dairy outfit, mechanical milking outfit, several styles of pumps and grinders, as well as washing machine, vacuum cleaner and numerous small heating appliances.

The display was under the direct supervision of two competent demonstrators, and while the Fair was in progress several cows were milked each day. The milk thus secured was "skimmed" by the separator in the dairy equipment, and later utilized by the demonstrator of the electrical household appliances.



Collingwood Demonstration



Collingwood Demonstration

Elmvale Fair—October 1st and 2nd, 1913

The Elmvale Fair Association also presented an application early in Septem- for a demonstration similar to that which had been arranged for the Coldwater Fair, and as a result the equipment exhibited at Coldwater was moved to Elmvale and displayed there for the three days following the Coldwater Fair.

Markham Fair—October 1st, 2nd and 3rd, 1913

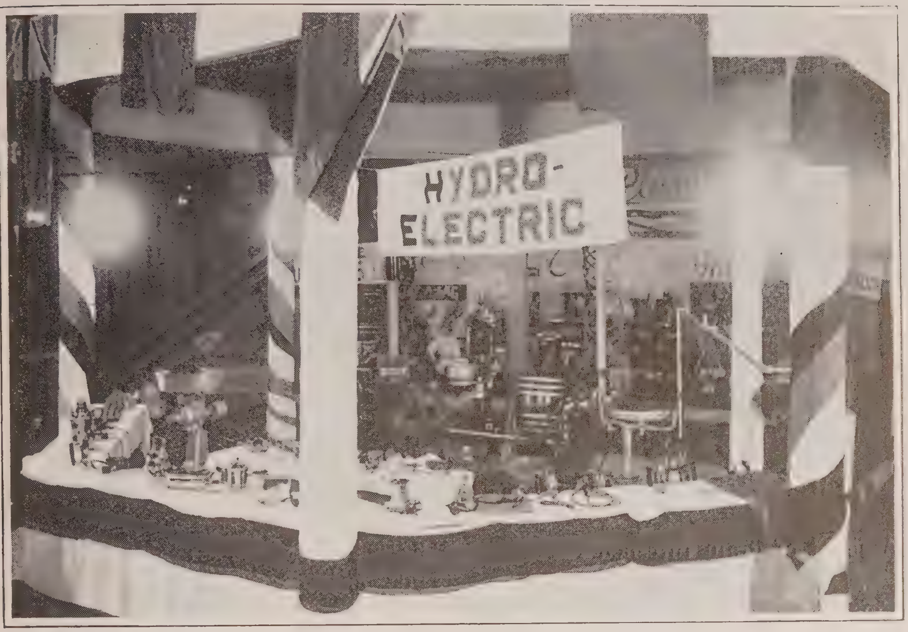
The Markham Fair Association, late in September, requested an exhibit at the Markham Fair similar to that of the previous year, and arrangements were made for a display accordingly of household appliances, under the supervision of a competent demonstrator.

Elmira Demonstration—October 29th and 30th, 1913

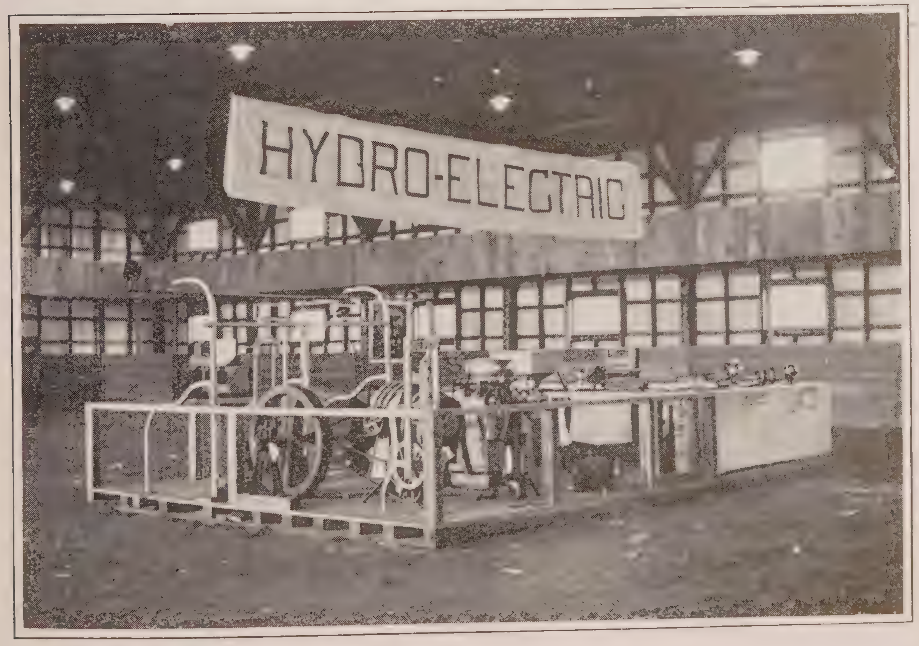
During the latter part of October, the Municipality of Elmira decided to hold a Fair to celebrate the inauguration of Hydro-Electric service in the town, and accordingly applied for the loan of sufficient apparatus to provide for a representative display.

The Fair was held in the local skating rink and the Electrical exhibit consisted of a collection of electrically driven household appliances, and a number of motor-driven farm machines which comprised a complete Dairy outfit, Double-unit Milking outfit, Circular Saw, Pump and Grinder. All apparatus was in charge of competent demonstrators and shown in actual operation; the milking machine, in particular, being operated several times a day, and occasioning an unusual amount of interest.

The Hon. Mr. Beck addressed those attending the Fair on the evening of the 29th, and gave an interesting description of the progress of electrical adaption in the rural districts of the Continent of Europe.



Goderich Demonstration



Coldwater Demonstration

RURAL DEMONSTRATIONS

Threshing with the Individual Threshing Machine, driven by 5 h.p. Motor

The threshing demonstrations last year were made with 25 h.p. equipments, and from this experience it was decided to demonstrate this year with individual equipments driven by 5 h.p. motors. Arrangements having been made to start the demonstrating at a certain date, the early threshing season prevented us from threshing at all the places scheduled, although the demonstrations were made at the following farms:—

B. C. Edward's, Dereham Township, near Ingersoll.
W. C. Edward's, Dereham Township, near Ingersoll.
J. C. Karn's, West Oxford Township, near Woodstock.
Chas. Fletcher's, North Norwich Township, near Newark.

Results noted are given below:

At B. C. Edward's, Dereham Township, Oct. 11th and 12th:

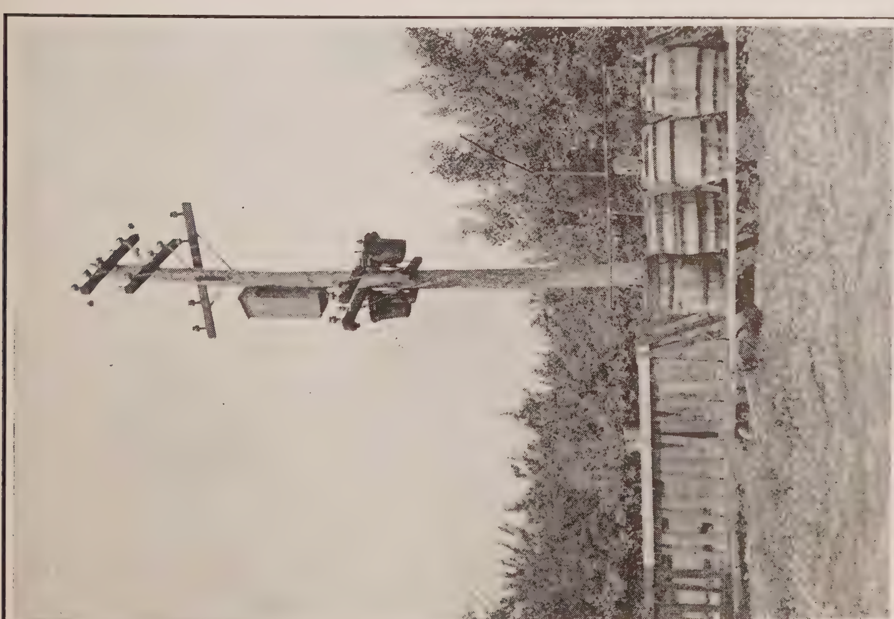
Amount of grain threshed	37½ bush. of wheat.
	368 bush. of oats.
Conditions of grain	Dry. Straw medium length and fine.
Running time	On wheat 2 hr.
	On oats 7 hr.
One minute demand	7 h.p.
Average demand	4.8 h.p.
Total kw-hr.	32
Total cost at 3c. per kw-hr..........	96c.
Cost per bu. wheat	.57c.
Cost per bu. oats	.2c.
Average bush. per kw-hr.	127
Notes *re* straw	Delivered straight back to staging.
Oats per hour	52.5 bush.
Wheat per hour	18.7 bush.
Thresher speed	1250 r.p.m.

This was the first place at which the machine was used and the results were not as good as later in the season, when the machine had been properly adjusted.

At W. C. Edward's, Dereham Township, October, 31st:

Amount of grain threshed	290 bush. of oats.
Condition of grain	Dry. Straw medium length and fine.
Running time	3¼ hours.
One minute demand	7 h.p.
Total kw-hr.	17 (estimated).
Total cost at 3c. per kw-hr.	51c.
Cost per bu.	.17c.
Bush. per kw-hr.	17
Notes *re* straw	Delivered by side carrier to the mow.
Oats per hour	89.2 bush.
Thresher speed	1250 r.p.m.

Blower Type of Ensilage Cutting and Silo Filling Outfit



Typical Service Installation

At J. C. Karn's, West Oxford, Nov. 5th, 6th, and 7th:

Note—Run to demonstrate its use so was only operated at intervals.

Amount of grain threshed	50 bush. oats.
	18½ bush. beans.
Total kw-hr	On oats 2.9
	On beans 1.6.
Total cost at 3c. per kw-hr	13.5c.
Cost per bu. oats	.17c.
Cost per bu. beans	.25c.
Speed of thresher	1,000 r.p.m. while running on oats, 630 r.p.m. while running on beans.
Demand, not measured	
Oats per kw-hr.	17.2 bush.
Beans per kw-hr.	11.6 bush.

At Chas. Fletcher's, N. Norwich Township, Nov. 10th to 15th:

Note—Hungarian Oats; notes were not taken of the grain threshed, etc. The results reported were very good, the grain coming clean with no carrying over.

Silo Filling with Individual Equipment driven by 5 h.p. Motor

During the Fall individual equipments for filling silos, driven by 5 h.p. motors were used at the following places:—

John Leigh's, Lot 23, Con. 2, West Oxford Township.
B. C. Edwards', Lot 2, Con. 1, Dereham Township.
W. O. Edwards', Lot 3, Con. 1, Dereham Township.
Chas. Fletcher's Lot 22, Con. 4, N. Norwich Township.
M. J. Cornwall's, Lot 21, Con. 4, N. Norwich Township.
Queen Alexandra Sanitarium, Byron, London.

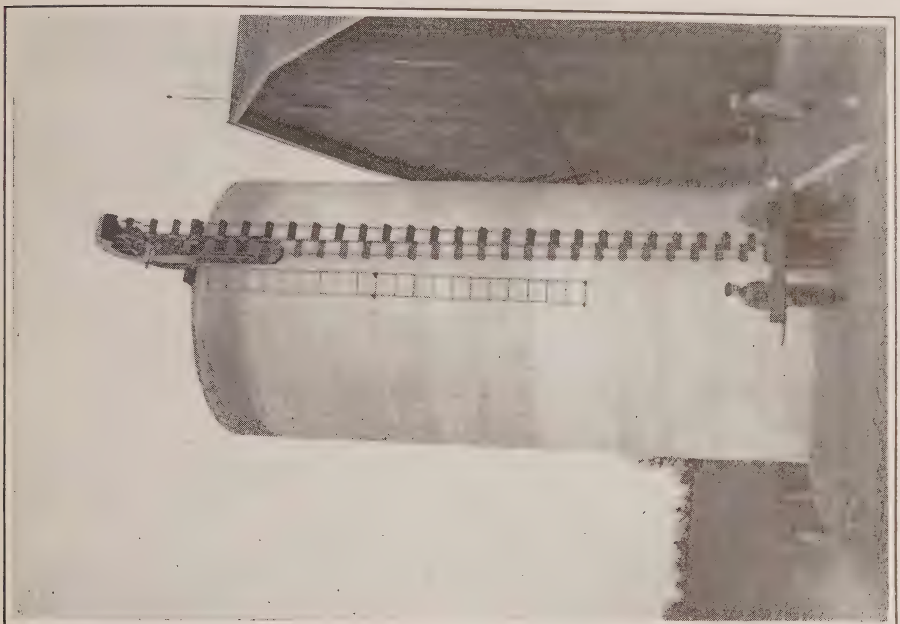
Notes were also taken on a carrier outfit driven by a 5 h.p. motor and an elevator outfit at—

D. W. Clark's, West Oxford, and Geo. Raymond and Sons, North Oxford.

Following is the detail of work done, current used, and other field data:

John Leigh's, West Oxford, Sept. 18th to 24th.

Box used	10 in. blower.
Size and Shape of Silo	Round 14¼ by 35½.
Height to elevate	32½ ft.
Capacity	5662.5 cu. ft.
Detail of Labor—	
2 teams and drivers	36 hr. 55 min.



Elevator Type of Ensilage Cutting and Silo Filling Outfit

Typical Service Installation

4 men	29 hr. 25 min.
3 men	4 "
2 men	3 " 30 "
Not including setting up or taking down.	
Amount put in	28½ ft.
Estimated weight	85 tons.
Total kw-hr	191
Total cost at 3c. per kw-hr.	$5.73.
Average h.p.	6.95
Average tons per hr.	2.64
Kw-hr. per ton	2.25
Cost per ton	6.8c.
Distance to field	60 rods.

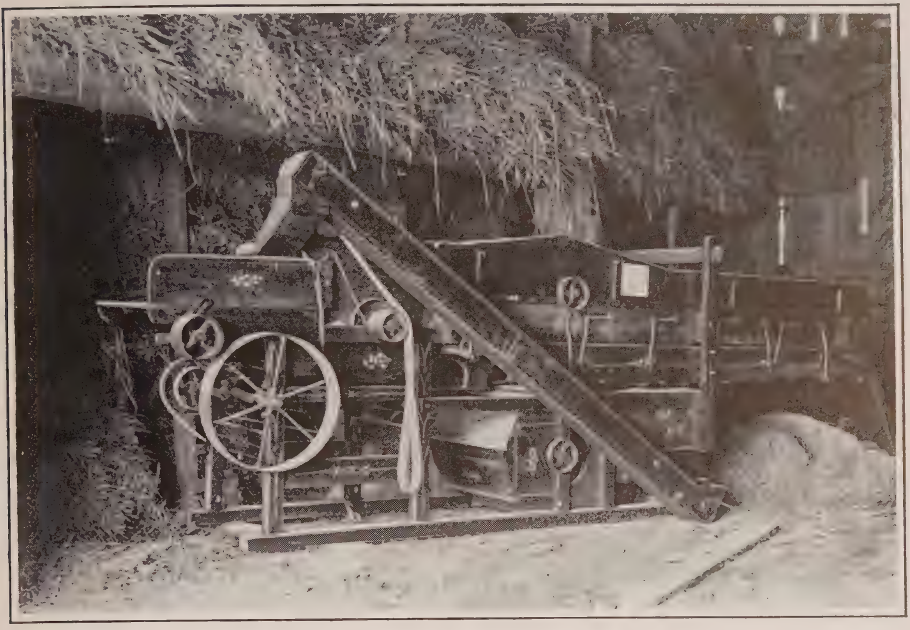
Notes—Corn was not shocked and we had rain several times while filling. It was wet most of the time. Material was cut in half-inch length.

B. C. Edwards, Dereham Township, Sept. 27th to Oct. 1st:

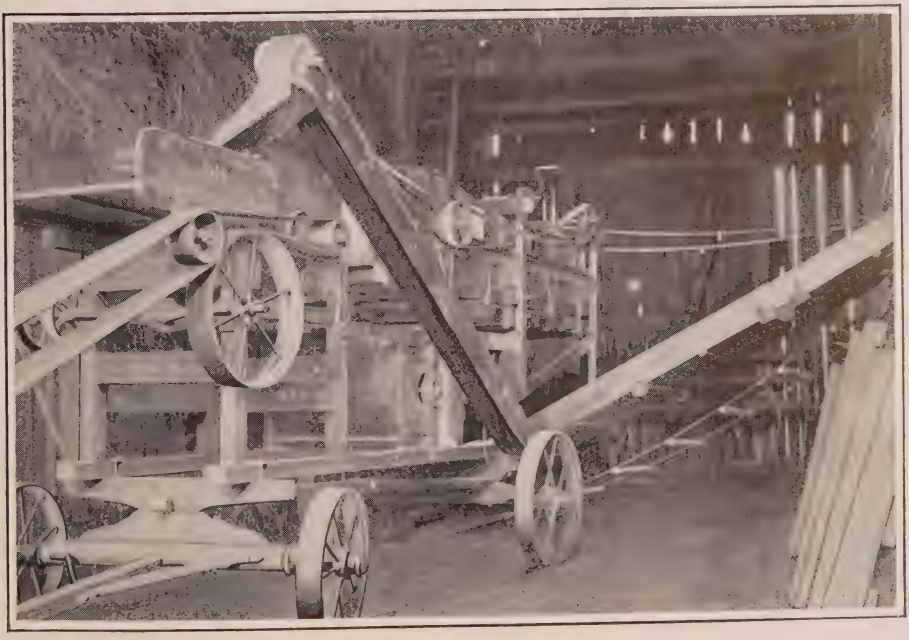
Type of box	**10 in. blower**
Size and Shape of Silo	Round, 12 ft. by 34 ft.
Height of elevate	32 ft.
Capacity	3958 cu. ft.
Detail of Labor—	
Two teams and drivers and 3 men	21½ hours
Amount put in	32 ft.
Estimated weight	72 tons
Total kw-hr	116
Total cost at 3c. per kw-hr.	$3.48
Average h.p.	7.2
Average tons per hr	3.35
Kw-hr. per ton	1.61
Cost per ton	4.8c.
Distance to field	3 rods
Corn	Dry
Cut	1 in.

W. O. Edwards, Dereham Township, Oct. 2nd to 10th:

Size and shape of Silo	Round, 14ft. by 35 ft.
Height to elevate	33 ft.
Capacity	5388 cu. ft.
Detail of Labor—	
Two teams and drivers and 3 men	28 hours.
Amount put in	31 ft.
Estimated weight	95½ tons
Total kw-hr.	147
Total cost at 3c. per kw-hr.	$4.41
Average h.p.	7.2
Kw-hr. per ton	1.54



Individual Threshing Machine Used in Demonstrations



Individual Threshing Machine Used in Demonstrations

Cost per ton	4.6c.
Distance to field	240 rods
Corn	Dry
Cut	1 in.

Queen Alexandria Sanitarium, London Township, Oct. 8th to 15th:

Type of Box	10 in. blower.
Size and shape of Silo	Round, 11¼ ft. by 29 ft.
Height to elevate	23 ft.
Detail of Labor—	
Two teams and drivers and two men	5 hours.
One team and driver and two men	40½ hours.
Run at intervals as loads came up.	
Amount put in	Full
Estimated weight	52.3 tons
Total kw-hr.	52.5
Total cost at 3c. per kw-hr.	$1.57½
Average h.p.	6.25
Kw-hr. per ton	1.
Cost per ton	3c.
Distance to field	20 rods
Corn	Very dry.
Cut	1 in.

George Raymond, North Oxford, Sept. 24th to Oct. 31st:

Type of Box	Fly wheel, with bucket elevator.
Size and shape of Silo	Round, 16 ft. by 42 ft.
Height to elevate	37½ ft.
Capacity	8444 cu. ft.

Detail of Labor—

Four men at work using two teams, cutting part of the time and filling at intervals; several days were lost on account of trouble with corn binder and with the elevator.

Amount put in	Full
Estimated weight	211 tons
Total kw-hr.	232
Total cost at 3c. per kw-hr.	$6.96
Minimum h.p. per 1 minute	2.68
Maximum h.p. for 1 minute	7.25
Kw-hr. per ton	1.1
Cost per ton	3.2c.
Distance to field by lanes	¾ mile.
Corn	Very dry most of time
Cut	½ in.

NOTE—This is an elevator outfit, buckets on a chain with a transfer carrier to pass the ensilage to the elevator hopper. It was not working well, especially the transfer conveyor, the material rubbing against the rim of the fly wheel, besides other mechanical defects as a result, the amount of power used per ton cut and elevated should be considerably less than is given in the foregoing table.

Blower Type of Ensilage Cutter

Elevator Type of Ensilage Cutter

D. W. Clark, West Oxford Township, Sept. 25th and 26th:

Type of box	Fly wheel with carriers
Size and shape of Silo	Round, 14 ft. by 30½ ft.
Height to elevate	21 ft.
Capacity	5388 cu. ft.
Details of Labor—	
Two teams and drivers and two men for two days	18½ hours.
Refill—1 team, himself and man	12 hours
Amount put in	Full
(20 loads put in later to refill)	
Estimated weight first fill and refill	100 tons
Total kw-hr. (fill and refill) ..	48
Total cost at 3c. per kw-hr.	$1.44
Average h.p.	5
Kw-hr. per ton	.48
Cost per ton	1.4c.
Distance to field	5 rods
Corn	Dry
Cut	1 in.

DEMONSTRATION FARMS

Results on the Demonstration Farms

In connection with the farms which are now being operated by Hydro-Electric power, it is of considerable interest to note how the farmers are actually using the power.

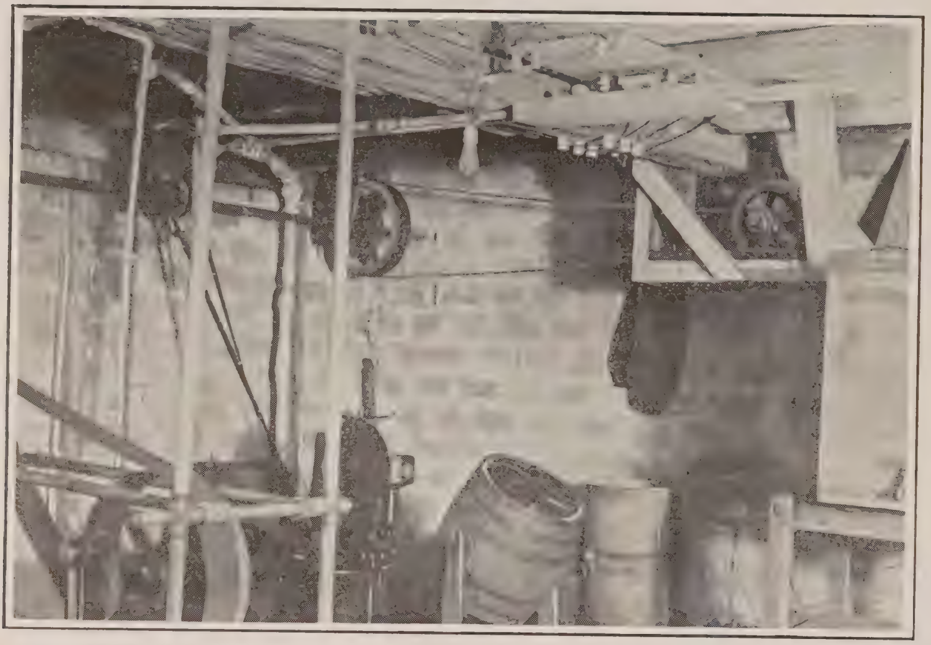
In the following tables, the detail of the work done, cost and cost per unit of work are given. It must be remembered, however, that some of these machines were not ready for the electric drive at the beginning of the year, as changes of this kind, on the farm, are made slowly.

Raymond & Son, North Oxford Township, Oct. 22nd, 1912, to Oct. 22nd, 1913

Work	Detail of work	% of Total Kw-hr	Cost	Cost per unit of work	Notes
			$ c.		
Grinding	500 bush. of oats	1.4	1 32	.26c. per bush.	
Milking	680 times Max. No. 30 cows. Min. No. 14 cows.	28.	26 93	.18c. per cow per milking.	
Fanning Mill	10 hours	.1	11	.91c. per hour.	
Pulping Roots	30 "	.7	70	.233c. per hr.	
Cutting dry corn	60 "	1.	95	.135c. per day.	
Heating water	325 times	3.7	3 52	.432c. per gal.	
Sawing wood by drag saw A	20 hours	.4	35	1.75c. per hr.	
Air Heater	2,080 hours	35.5	33 86	1.62c. per hr.	
Toaster	91 times	.2	16	.176c. per time	
Electric Iron	84 hours	.8	74	.88c. per hr.	
Washing Machine	84 hours	1.2	1 18	1.42c. per hr.	
Lighting		27	25 84	1.84c. per kw-hr	
Threshing					Steam.
Silo filling	16 ft. by 42 ft. silo 211 tons (Estimated)		6 96	3.3c. per ton	Extra over contract

R. A. Penhale, North Yarmouth Township, March 16th to Oct. 18th, 1913

			$ c.		
Grinding	None				
Pumping water	4 hr. per day (6,125 bbl.)	28.3	17 75	.11c. per bbl.	
Milking	421 times—30 cows	23.7	14 98	.12c. per cow per milking.	
Separating cream while pumping	316 times	8.2	5 20	1.1c. per hour	
Heating water	1,210 hours 2,420 gallons.	29.	18 35	.7c. per gal.	
Lighting		10.8	6 74	2.74c. per kw-hr	
Sawing wood, Threshing, Silo Filling					By his steam engine.



Electrical Farm Equipment—E. Cohoon's, North Yarmouth

Motor Belted to Shaft for Driving Deep Well Pump

Alex. Anderson, South Yarmouth Township, Dec. 13th, 1912, to Nov. 13th, 1913

Work	Detail of work	% of Total Kw-hr	Cost	Cost per unit of work	Notes
			$ c.		
Grinding	2,800 bush. oats and and wheat, mixed.	45	39 60	1.41c. per bush.	
Milking	By machine, while testing it 14 times..	2.7	2 38	Testing Machine.	
Pumping	Using Jerker just put in	.9	79	....	Windmill, mostly Jerker, just put in,
Water Heater	680 hours .... 2,724 gallons,	19.7	17 34	.63c. per gal...	
Electric Iron	120 hours	2.9	2 55	2.1c. per hour ..	
Toaster	Not used	......	......	....	
Lighting	....	28	24 63	4.62c. per kw-hr.	
Sawing wood	8 hr.—25 cords stove wood	.8	71	.27c. per cord stove wood.	
Threshing and Silo Filling	....	......	......	....	By steam this year.

Ezekiel Cohoon, North Yarmouth Township, March 18th to Oct. 18th, 1913

Work	Detail of work	% of Total Kw-hr	Cost	Cost per unit of work	Notes
Grinding	None				
Milking	30 cows 224 times.	11.7	7 37	5c. per cow per milking	
Heating water	3,000 gals	37.6	23 69	8c. per gal	
Separating cream	60 hours	1.4	0 88	1.45c. per hour..	
Electric Iron	16 hours	.3	0 20	1.25c. per hour .	
Pumping	856 hours	26.4	16 56	2c. per hour ..	
Lighting	....	22.6	14 25	2.15c. per kw-hr.	
Silo Filling, Threshing	....	......	......	....	By his steam engine.

Queen Alexandra Sanitarium Farm, London Township

Late in the year this farm was equipped as a demonstrating station as it is located near London, the centre of a large dairy district, where a great many farmers visiting the City could see it. The equipment consists of—

In the barn

A 7½ h.p. motor belted to a line shaft.
An individual threshing machine.
An ensilage and straw cutter.
A chopping mill and
A root pulper.

In the dairy

A cream separator belted to an individual motor.
A combination churn and butter-worker belted to a ½ h.p. motor.
A 20 gallon water heater.

In an annex to the laundry

A roller table wood saw.

In the Doctor's residence

An electric range.

In the basement of the Administration Building

A refrigerating and ice-making plant.

In the laundry

A complete water works system with a three-throw pump geared to 1½ h.p. motor, delivering water to a large steel pressure tank.

A 10 h.p. motor driving a counter shaft, to which is belted a large washing machine.

A centrifugal drying machine, and

A steamheated mangle.

Rural Distribution

The enterprise shown by farmers and residents in small villages has aided greatly our efforts during the past year to promote the use of electric light and power in the rural districts of Ontario.

A rural distribution system for the use of farms and small villages has been commenced in ten different townships. In some cases where they are of any size the business is handled by the Township. In other cases the nearest town handles the work until the system grows, when it is taken over by the Township. This arrangement has proved very satisfactory, since it enables a number of demonstration farms to be established in various parts of the country and gives the rest of the Township an opportunity of seeing electric light and power in operation on the farm. Much useful information has been gained on these farms for determining the most suitable installation of motors and machinery for the average farmer's use and in arriving at the proper system of charge for different kinds of service.

Electrical Equipment for the Farm

The usual installation recommended for the average farm house consists of a complete lighting system, using 25 watt and 40 watt lamps, a 500 watt flat iron and sometimes a vacuum cleaner and electric stove, while in the cow stable a row of lights behind the cows, about 1-20 c.p. lamp to every three cows, is usually recommended. Three or four 20 c.p. lamps are usually enough for the horse stable, while two in the hay mow, one in the silo, and one in the drive-shed are most frequently employed. This installation with a good 100 c.p. lamp on a pole in the yard gives ample lighting for the farm.

A 5 h.p. motor is also generally recommended for power purposes. This motor may be used in two ways with good results: either it can be fixed permanently in the barn and made to run a line of shafting, or it can be mounted on a truck and moved from place to place, arrangements being made at the pump, in the yard, and in the barn, to connect to the motor.

An accompanying illustration shows the motor installed permanently in the barn for driving a line of shafting and pulleys, which in turn drive a milking machine, cream separator, churn, threshing machine, grinder, straw cutter, ensilage cutter or root pulper separately.

Rural Rates

The question of rates in rural districts is influenced more or less by several considerations. In the first place the consumer is generally one who is unfamiliar with the use of electric power and it is desirable to give him a rate that he can readily understand; secondly, the load factor varies very considerably in different Townships, and lastly it is always necessary to make a certain fixed charge on each consumer to cover the annual charges on the invested capital in the Township.

From the point of view of simplicity to the consumer and to the Township in billing, etc., the flat rate has obvious advantages, but any form of limitator, fuse, or other device for keeping the consumer to his contracted load is more or less unsatisfactory, especially in districts where motors are used to any extent. A meter rate is difficult to determine in a large Township as the load factor over the whole Township is more or less unknown and the cost of reading meters over a large area involves considerable work for the Township officials, who, as a rule, have not the same facilities as Towns for carrying out work of this kind.

A method which has certain advantages is to give the rural consumer a flat rate and, on those farms where the connected load is considerably above the load contracted for, to install a two-rate meter which will register on one dial the total number of kilowatt hours used and on another the number of kilowatt hours used over and above the contract amount.

All the above methods are in use at present in one or other of the Townships served and in many places an alternative meter rate or flat rate is allowed.

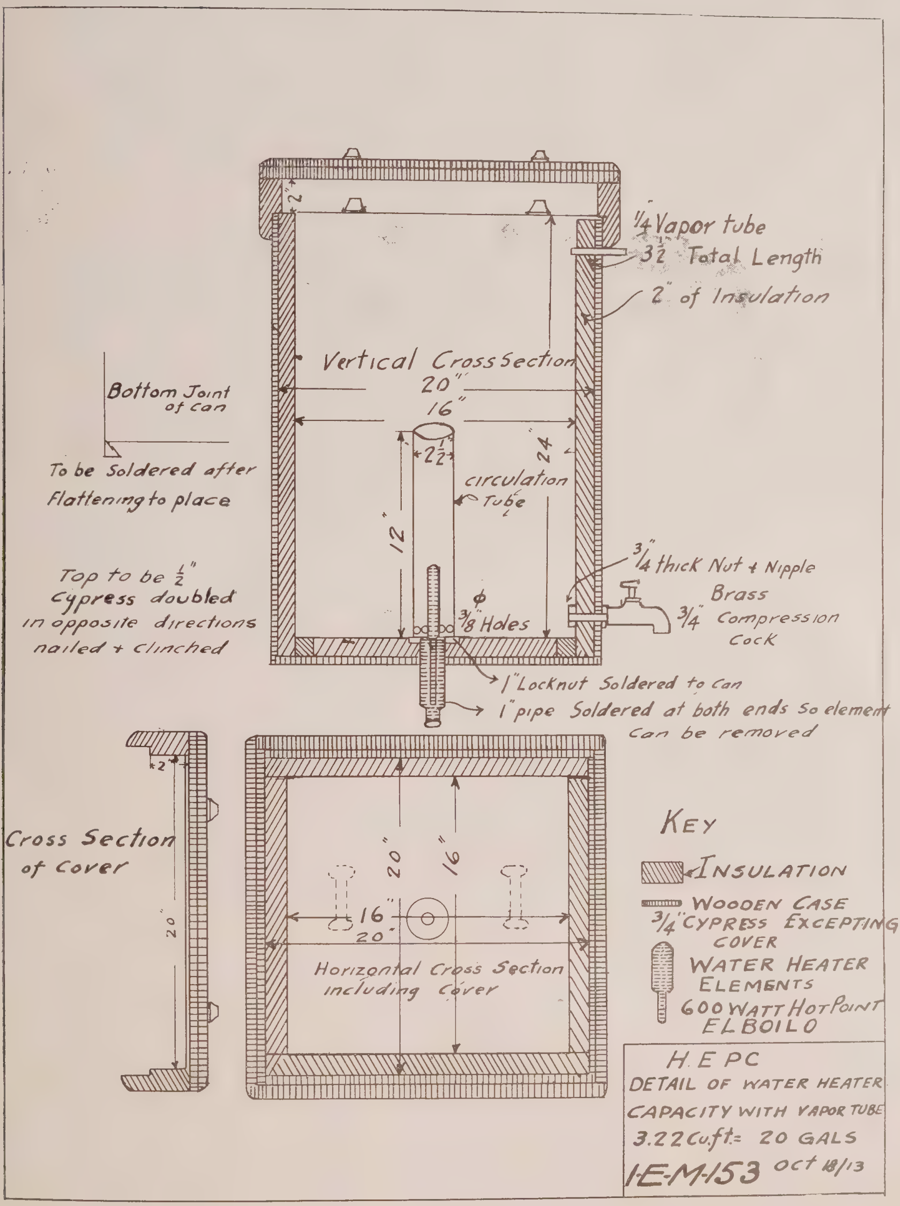
The results are being watched carefully in these Townships and, from the data obtained, a standard schedule of rates for rural distribution will shortly be compiled.

RURAL POWER RATES

Name of township	Fixed service charged per annum	Meter rate per Kw-hr	Alternative flat rate per h.p. year	Miles of line built	No. of contracts connected	Sgd, contracts not yet connected	Miles of distribution proposed or under construction	Remarks
	$ c.		$ c.					
Toronto	24 00	....	36 00	11	72	132	19	Additional miles under construction.
West Oxford...	36 00	....	30 00	5.5	11	4		
Waterloo	24 00	5c. 10 % prompt payment.	30 00	7	....	12 Village of Breslau.	10	These consumers will be connected at once, also 2 factories.
North Norwich.	24 00	4c	36 00	4	9	1	12	Township to be canvassed.
North Yarmouth	36 00	....	35 00	2.7	10	1		
South Yarmouth	24 00	....	36 00	.5	3			
North Oxford..	24 00	....	36 00	.75	1	2		
Downie........	24 00	5c	30 00	....	Village of Sebringville.	....	20	Township to be canvassed.
Grantham	24 00	4½c. 10 % prompt payment.	22 00	....	....	75	21	Twp. now being canvassed.
Wilmot	$1 per h.p. per month.	Power 5.1, 3.4, 0.4c Com. Lt. 12 & 6c., Dom. Lt. 4 & 6c.	....	6	Village Petersburg Village, St. Agatha.	6	7	

From the above table it will be seen that the rural lines serve a number of farms in various Townships and in addition to these the villages of Clarkson, Cooksville, Dixie, St. Agatha, Petersburg, Sebringville and Breslau.

In every case before building lines in rural districts, contracts must first be signed by consumers with their respective Townships and the lines are built only when there are sufficient consumers to make it pay. This accounts for the number of consumers shown in the schedule as signed but not connected.

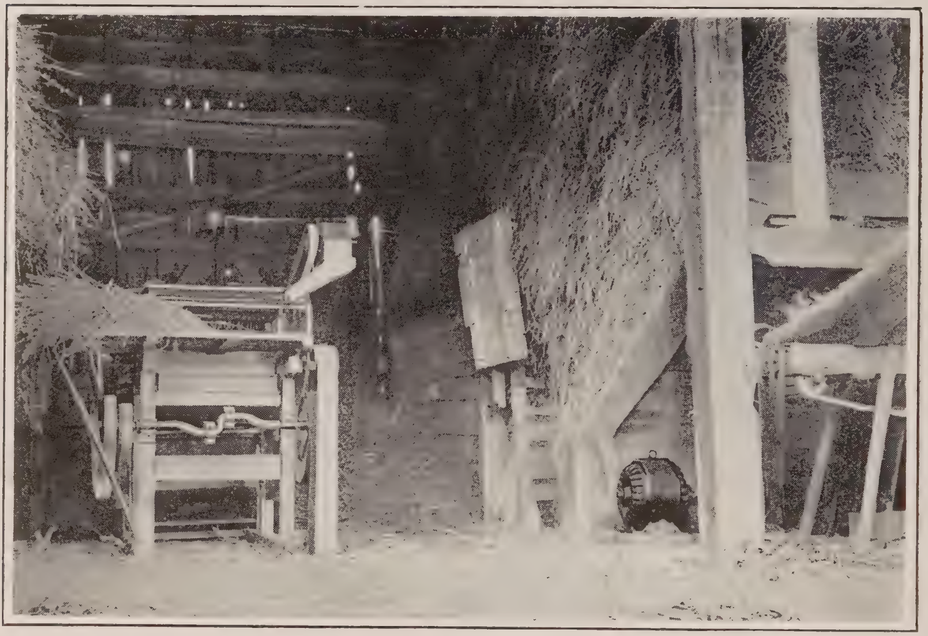


Detail, Electric Water Heater.

Lighting the Roads

There has always been a very general demand for some form of road lighting in the rural districts, and although it is not necessary to have as much illumination as in towns and cities, lights are sometimes required along the roads and at such places as railway crossings, bridges, culverts, grades, etc.

In those districts where cost is of primary importance it is usual to install one 100 watt lamp outside the gate of each farmer who is being served with power. This light is placed directly under the cross arm and is controlled by a switch near the front door of the farmhouse, while in districts where a more complete lighting system is required, it is usual to install a series lighting system with 100 watt lamps and radial wave reflectors every 1,000 feet.



Electrical Farm Installation—D. W. Clark, West Oxford

Estimates are now being prepared for a series street lighting system along the main roads of Toronto Township and in North Norwich Township, the plan of placing lamps outside each farmer's gate is being adopted with good success.

Special Equipment

A most important part of the electrical equipment on the farm, namely, a water heater, is shown in an accompanying illustration. This heater consists of a galvanized iron tank, capable of holding about 20 gallons of water, surrounded by insulating material and a wooden casing to reduce the heat losses. A 600 watt heating unit is put into the bottom inside of the tank. Most of the farmers are purchasing their current on a flat rate, so that this heater provides a good use for their available current at night. On going to bed the farmer starts the heater and in the morning has a good supply of boiling water in the milk house for washing the milk pails, cream separator parts and milking machine parts as

well as for making bran mash or other mixtures for a sick animal. This has been found one of the most useful applications on the farm as the milk inspectors insist on thorough cleanliness in the dairy.

Methods of Filling Silo

Filling silo has always been regarded as one of the heaviest pieces of work on the farm and in most cases it is done in a most uneconomical manner as far as the power is concerned, as the blower boxes generally in use are most inefficient. A careful comparison between four methods of silo filling is made in the following table:—

COMPARISON OF VARIOUS METHODS OF FILLING SILO

Data.	With a large Blower Cutting Box and 25 h.p. Motor. No. 1	With 10-in. Blower Cutting Box and 5 h.p. Motor. No. 2	With Fly Wheel Box and Carriers, set inside barn, 5 h.p. Motor. No. 3	With Bucket Type Carriers and 5 h.p. Motor. No. 4
Size of Silo	14 ft. by 35 ft.	14 ft. by 35 ft.	14 ft. by 30½ ft	16 ft. by 42 ft.
Quantity put in	108 tons	89 tons	100 tons	211 tons
Total time	11 hr. 10 min.	36 hr. 55 min.	12 hr. 50 min.	69 hr.
Kw-hr	215	191	48	232
Average h.p	25.8 h.p.	6.92 h.p.	5 h.p.	4.5 h.p.
No. of ft. tons	3,780	3,115	3,050	8,862
Kw-hr. per ft. tons	.057	.061	.015	.026
Cents per ft. ton	.285	.305	.075	.130
Total cost of labor	$38.50	$66.60	$28.00	$82.80
Labor cost per ft. ton	1.02c.	2.14c,	.92c.	.935c.
Total cost per ft ton	1.305c.	2.445c.	.995c.	1.065c.

11 H.

UNDERGROUND CONSTRUCTION

Brantford

At the request of the Brantford Hydro-Electric System an estimate was prepared and recommendations were made in connection with the installation of an ornamental street lighting system in the down town district.

The work is now under way. The lamps are 6.6 ampere direct current magnetite arcs mounted on cast iron standards and are fed by a lead covered, steel tape armored cable, laid in the ground. It is expected that the lamps will be in operation before February 1st, 1914.

Chatham

An estimate was made for an underground conduit system in the business district on King Street, from 3rd Street to William Street. Provision was made for feeding by underground cables the ornamental street lights as well as the buildings on this street.

The work will probably be installed in the summer of 1914.

Galt

In June, 1913, an inspection was made of an ornamental lighting system which was being installed by the municipality in the residential district. A total of 148 single light standards with 100 watt tungsten lamps were erected on Brant Road, Wentworth and Lansdowne Avenues and neighboring streets. The work was done as a Local Improvement.

Estimates were made for an underground conduit system proposed in conjunction with an installation of ornamental street lights in the commercial district and recommendations in regard thereto forwarded to the local Hydro-Electric Commission.

Goderich

Around Court House Square 32 ornamental standards with tungsten lamps were erected, 16 of these being 3 light and the remainder single light standards. Paper insulated, lead covered steel tape armored cable was laid in the macadam roadway to feed these lights.

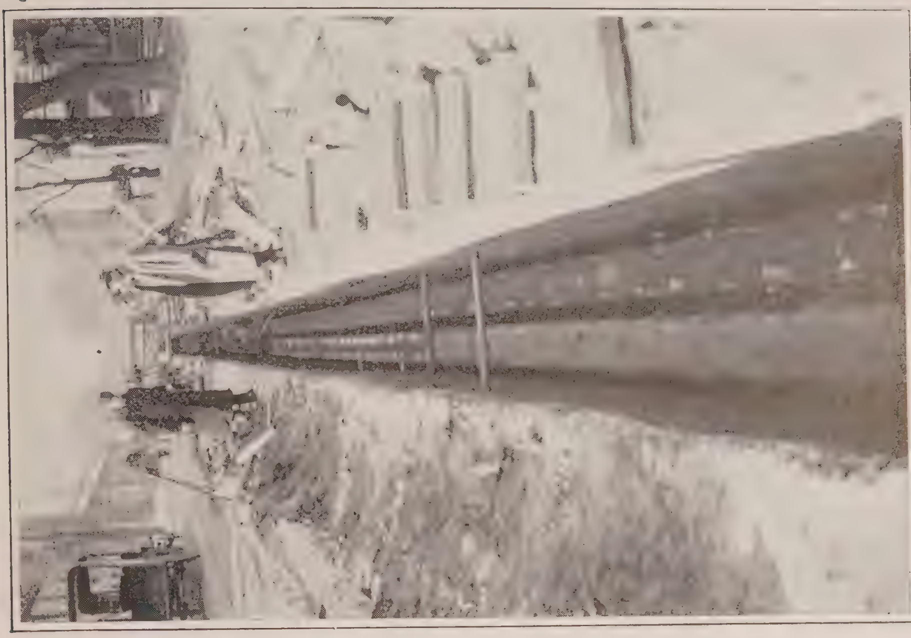
An underground service was also installed to the Court House, so that the Square is now free from overhead lines.

This work was completed in October, 1913.

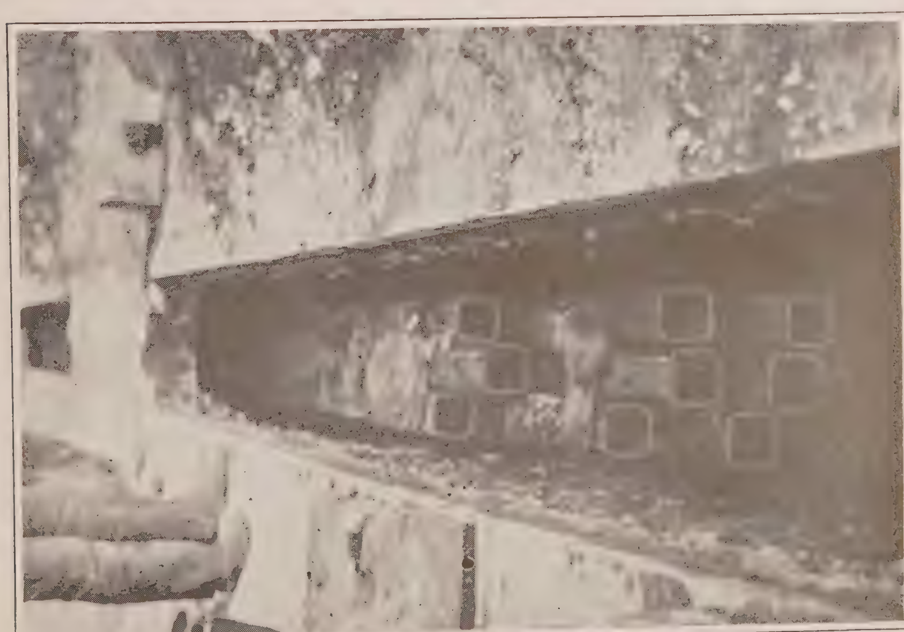
Hamilton

In pursuance of the Hydro-Electric Power Commission's order, dated Nov. 24th, 1912, providing for the removal of overhead lines from certain streets in Hamilton, and the installation of underground conduits for the use of various companies concerned, plans and specifications for a Joint Conduit System were drawn up.

After the approval of these plans by the Commission, tenders were invited for the construction of the conduit system and these were opened on August 27th, 1913. The work contemplated included the installation of between 650,000 and 700,000 duct feet of conduit with manholes, service boxes and other appurtenances.



Underground Conduit, Vine St., Hamilton



Duct Run on Wellington St., Kingston

The contract for this work was awarded to the G. M. Gest Company, of Montreal, at an estimated cost of $177,822.95, this tender being the lowest.

Actual construction work was commenced on Sept. 12th, 1913, and to date, Oct. 31st, the following has been completed:—

245,500 duct feet of conduit.
32 manholes.
29 service boxes.

This system is notable in that the duct runs of the two electric light companies and two telegraph companies are laid in a common trench as a unit structure, being separated, however, from one another by concrete walls.

There are three sets of manholes which are quite separate from one another and have separate entrances from the street surface.

The telegraph companies occupy the same manholes jointly, which are separated from those of the electric light companies, which, again, are separate from one another. This arrangement was found to be somewhat complicated and at some locations difficult to carry out on account of the congestion beneath the roadway of various gas, water and other mains. The results, however, are highly satisfactory and fully justify the precautions taken to isolate the various cable systems.

It is expected that all the conduit laying covered by the order of the Commission will be completed in the early part of 1914.

The whole installation is subject to the regulations and approval of the Hydro-Electric Power Commission and our engineers have been constantly in touch with the work.

Kingston

On April 23rd a preliminary layout for an underground conduit system and an ornamental street lighting system for the commercial district was forwarded to the municipality, the total cost of same being estimated at $34,000.

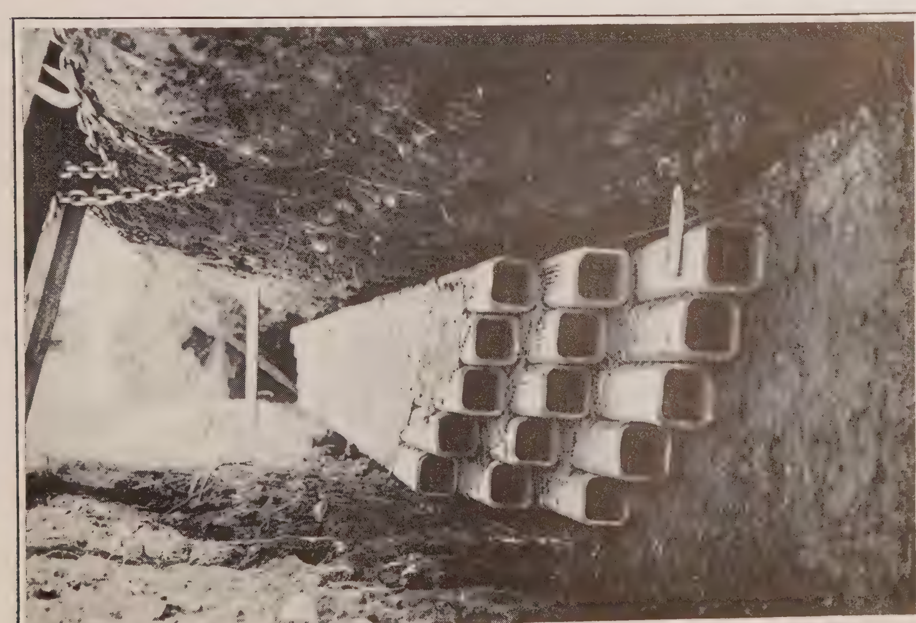
During the first week in June, a by-law was submitted to the people for approval of the expenditure of the above sum for the purpose stated. This by-law was passed by a large majority. In August, detailed plans and specifications were drawn up for the supply and installation of conduit, lead covered cables, combination street railway and lighting tubular steel poles, cast iron lighting standards and ornamental lamps.

On Sept. 19th, tenders were received for the supply of conduit and the installation of the conduit system. The contract for installation was awarded to "Dietrich Limited," of Montreal, on a unit price basis for duct runs, manholes, service boxes, services to buildings, etc. The estimated cost at the prices submitted being $11,887.00.

The contract for the supply of 3½ inch square bore single duct conduit was awarded to the same firm at a price of 6 cents per foot for 23,000 feet. This duct was manufactured by the Clermont Sewer Pipe Company, of New York.

Construction work was commenced on Oct. 8th, under the supervision of the Commission's engineers. On Oct. 21st, a request was received from the municipality for an estimate covering an extension of the underground system on streets not included in the original plans. The cost of additional work was estimated at $25,000.

Service Box on Bagot St., Kingston



Underground Conduit leading out of Paris Station

On Oct. 28th, the City Council decided to proceed with the additional work. Good progress is now being made and the conduit system will be completed before the end of the year. The ornamental street lights will be in operation about April 1st, 1914.

Paris

In connection with the alterations being made in the municipal substation, it was decided to lay an underground duct run from the switchboard to the 4-pole structure some 200 feet in the rear of the substation.

These ducts will contain the feeders for the distribution system and the overhead lines will be terminated on the pole structure.

The above work is now under way. Plans for the ornamental lighting on Grand River Street have been prepared and the installation of the same will be made in 1914.

Peterboro

Investigation was made in May, 1913, to determine what underground work it would be advisable to install in connection with the proposed ornamental street lighting system on George, Hunter and Charlotte Streets. It was found that the commercial secondary wires could be run on wooden poles in alleys at the rear of the buildings, thus avoiding the expense of underground ducts and cables for this purpose on the main streets.

Steel tape armored cable was laid in the roadway to feed the series ornamental magnetite arcs. This cable was installed during July and August, 1913, and will be in operation before the end of the year.

St. Catharines

Estimates were made for the installation of an underground conduit system on St. Paul Street from Ontario Street to Geneva Street. The cables in this system will feed both the commercial and street lighting. The cluster lights will be re-arranged and the above work installed in 1914.

Welland

Paper insulated cable of Submarine Type and cable terminals were supplied to this municipality for carrying power under the Welland Canal.

Windsor

An investigation was made during June, 1913, into the requirements of the business district for underground conduit construction. It was found that practically all streets were paralleled by lanes which were well suited to the locating of poles and wires therein.

It was decided, therefore, to lay armored cable to feed the street lamps and to carry the other circuits on the poles in the lanes.

An ornamental street lighting system is to be installed on the Local Improvement plan and estimates were prepared of the cost of several alternative propositions. This work will be commenced as soon as the type of lighting is decided upon and the petitions therefor signed.

ELECTRIC RAILWAY PROJECTS

During the last session of the Legislature, a bill was presented by the Hon. Adam Beck, authorizing the construction and operation of electric railways by groups of Municipalities. The bill, as given under the legal section of this report, was duly passed in April, 1913, and it was at once evident that many Municipalities would avail themselves of the authority given under the Act to improve the transportation facilities of their districts.

The steam railways throughout the Province, supplemented by a few interurban lines, are taking care of the traffic requirements on the through routes in a fairly satisfactory manner, but the accommodation given on the branch lines, where there are no electric roads to assist, is not all that it should be. Towns and cites located on these branch lines are small and scattered, but the rural sections are comparatively well settled by an industrious and fairly well off population. The lack of conveniences, the chief of which is railway service, has resulted in a decrease in population in these districts, and, unless these matters are attended to, a further decrease is bound to occur. A steam railway is inherently handicapped in serving a rural population, as stations and stops are so far apart that intending passengers are forced to drive many miles, often times parallel to the tracks, to reach them. With such conditions existing, the rides per capita are few and the train service very infrequent, which results in the railways being blamed for the decrease in population, when the real reason lies in the type of motive power used. Short interurban electric lines would not be paying investments in many of these districts, as the population is not sufficiently dense to supply the necessary passenger service and very little freight business could be obtained.

As provided for in the Act, the Commision is required to investigate and report on electric railway projects on the receipt of proper resolutions from the Municipalities interested, and, a number of requests having been received and sanctioned, the Railway Division of the Engineering Department was formed to carry on this work.

It was first necessary to examine into the local conditions of population and customs in the several districts for the purpose of comparing proposed lines with roads that have been operating for some years. Statistics and information from existing lines were then collected, and general standards selected for use in estimating the capital cost and operating expenses.

The usual interurban road in the States obtains most of its revenue from passenger traffic between large centres but, as few large towns and cities are found in Ontario, it must be expected that the business obtained by our proposed lines will be of a different nature. It was possible, however, to obtain much useful data by studying the returns of various lines in that country.

Some countries in Europe have developed systems of interurban railways with very satisfactory results, but, conditions existing there as regards manners and customs of the people, cost of construction, material and labor, etc., are so radically different from those encountered in this Province, that it is difficult to procure suitable comparisons.

The State of Belgium has had a system of public owned railways in operation for a number of years, and the report of the Board of Management as presented for the work in hand last year, gives the following information:—

Lines in operation approximately	2,500 miles
Lines under construction approximately.	400 miles
Lines under study	1,000 miles
Capital cost of lines in operation or under construction approximately	$70,028,800.00

These lines are built by funds raised by the State, Provinces and Municipalities.

Since April last, when the Act above referred to was passed, requests for reports and estimates on some 500 miles of line has been received from various sections of the province. Those on which work has been done are given herewith.

Toronto—North-Eastern District

In answer to a request in the form of resolutions from a large number of municipalities in this district, a survey party was placed in the field, and after preliminary information had been obtained, a tentative report was prepared and submitted to the representatives on the 8th of October.

This report, which has been printed and is available for distribution, considers the construction of five different schemes varying in length from 16 to 71 miles, and requiring a capital expenditure, without provision of a subsidy from the Dominion Government, of $797,003 to $2,932,276. Operating revenues were estimated from $137,500 to $450,500, and operating expenses from $152,600 to $396,660.

The delegates, at a later meeting on the 29th of October, accepted the report in full, and asked the Commission to at once prepare a form of agreement to be entered into by the Municipalities. At this time the surveys are being completed, and the Commission expects to be able to present a final report within a few months.

Barry District

During the summer, a resolution of the Council of the town of Barry was received, asking for a report and estimate on an electric line from that town to make connections with the Canadian Pacific Railway.

It was suggested that this proposed line be run in a northerly direction, which would require some 15 or 20 miles of line. However, it was found on inspection that an exceptionally good route could be secured in a westerly direction, that would only require some 8 miles of line to give the desired connection.

A preliminary survey was made of this route, and a line projected and estimated upon from the data collected in the field. It now remains to secure the estimated traffic and prepare a report to be submitted to the town.

Huron County

The town of Goderich forwarded a resolution of their Council towards the end of September, 1913, asking for a report on an extensive net work of radial lines throughout Huron County. A survey party was immediately placed in the field, and preliminary lines are now being run for the purpose of preparing estimates on the cost of construction. This work will be completed before the severe winter weather sets in, and will allow a report to be forwarded to the Municipalities interested before spring.

TORONTO LABORATORY AND STOREHOUSE

During the early months of the year there was completed on Strachan Avenue the building designed to accommodate the departments engaged in experimental and testing work, and also to provide storage for the large amount of line hardware which the Commission has found necessary to stock, not only for itself, but for the Municipalities taking advantage of the benefits of co-operative purchasing. The plans provided for a building 110 feet by 70 feet, of three stories and basement. Approximately one third of the area was to be devoted to Laboratory work, and the remainder of the building used for the storage of the large quantities of construction material, lamps, meters, and other incidental supplies.

Toronto Laboratory and Storehouse

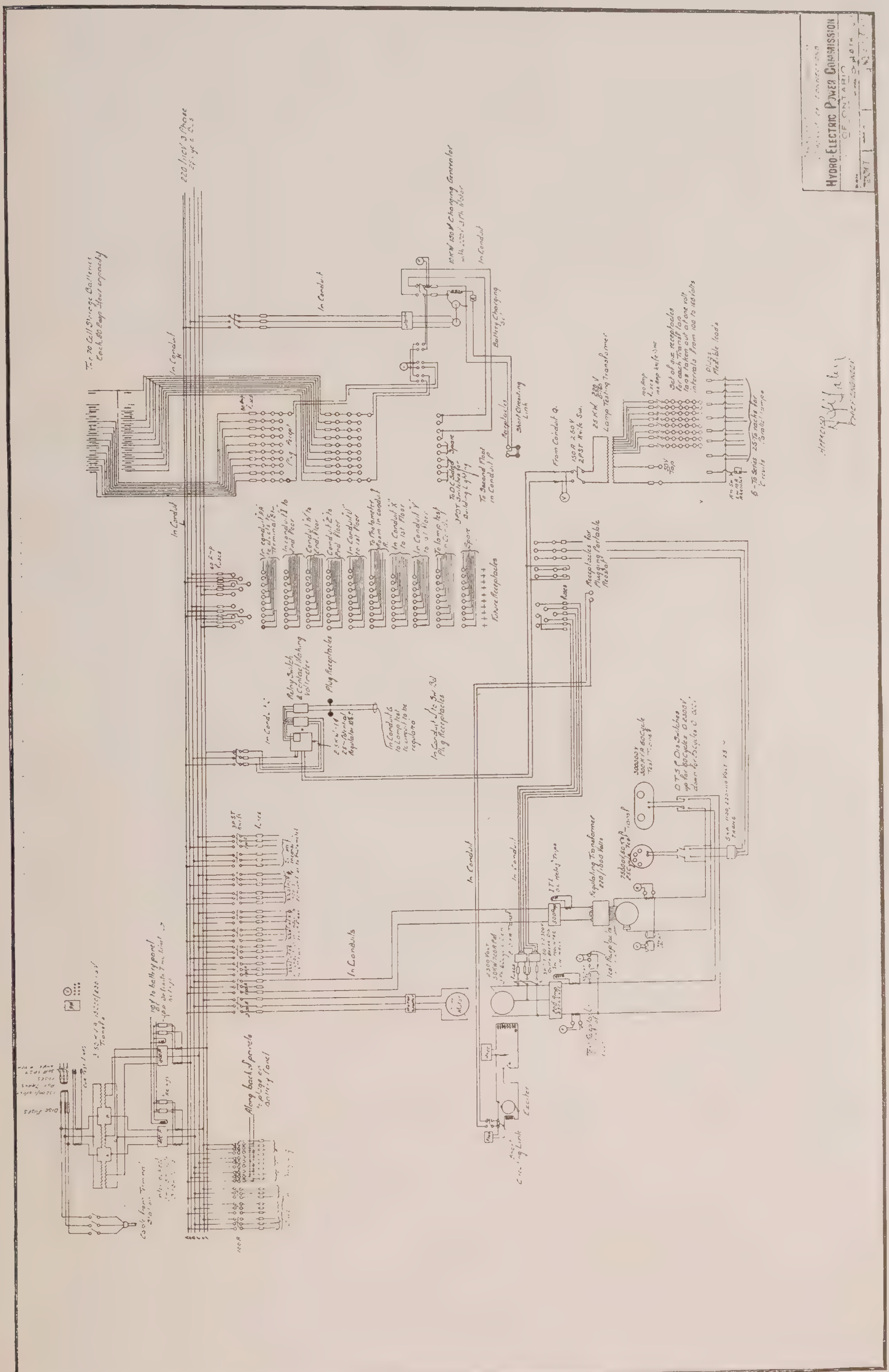
Storehouse

In May, the storage of materials commenced in the new building, and supplies which formerly had been widely scattered, became centralized in Toronto. The hardware kept in stock varies from 20 in. Machine Bolts and 30 in. Crossarm Braces to 2-318 in. Carriage Bolts and 11-16 in. Washers, and an average stock of some sixty thousand lamps of all sizes is maintained. The Exhibition siding is close by the building, and arrangements are being made to have this extended to the shipping platform of the Storehouse, in order that car-load lots may be handled more expeditiously.

Since the active operation of the Storehouse Department commenced, a rapidly increasing business has been done for the Municipalities, the low prices which are obtained by the Commission on the large quantities of material ordered, and the immediate delivery that can be effected from the large stocks maintained, being points of unquestionable benefit to the customer, and ones not to be neglected.

Corner of Shipping Room

Section of Lamp Stock



Wiring Diagram of Laboratory

The value of the storehouse as an organization is very largely increased by the inclusion in the same building of the testing laboratories. Material to be bought according to Commission's specifications can thus be fully proved before being accepted and placed in stock. The defects of old patterns can be investigated and recommendations submitted, and new types of hardware may be designed.

Laboratory

Separated from the stores proper by a dividing wall, is the section of the building where are located the departments engaged in testing and research work. These include High Tension and General Testing, Standards and Meter, Lamp and Illuminating Engineering, and Laboratory Workshop. The work carried on in these Departments will be taken up later on in this report.

Standards and Meter Department

The general electrical equipment of the Laboratory, owing to the wide range of testing carried on, necessitated a great deal of forethought and the exercise of considerable ingenuity.

Standards and Meter Department

With the continued increase in the amount of power handled and sold, the problem of providing suitable means of measuring this energy becomes one of great importance. The most commonly used method of metering power sold in small blocks, is by use of the watt-hour meter, which gives on its dials a record of the product of power by the time during which it was used, but for special purpose and usually for large blocks of power, a number of other types of measuring apparatus, such as graphic meters and demand indicators, are in use,

and for very small users a number of current limiters have appeared on the market.

Before the commission can approve any of these types of apparatus for use by its customers, the instrument must prove its efficiency for the work which it will be called upon to perform. With this object in view, the Meter Testing Department was organized and equipped. This work was formerly carried on in a temporary laboratory located in Toronto Station, where sufficient apparatus was installed to run tests of comparison, and to obtain characteristic curves on watt-hour and other meters. But as lack of room of precise standards, and of steady sources of voltage were detrimental to the high class of work necessary, space was allotted and suitable apparatus selected to install and equip a first-class standardization laboratory and meter workshop in the Commission's new storehouse on Strachan Avenue.

The large number of types of meters tested in the old laboratory being of Canadian, American, British and Continental manufacture, presented widely different characteristics, both electrical and mechanical, and the necessity soon became evident of obtaining a common basis of comparison, as well as definite rules for acceptance or rejection of various types. These rules must be sufficiently flexible to include all classes submitted, and yet rigid enough to eliminate those meters which would not prove a good investment.

With this object in view, information was gathered from every accessible source on both sides of the Atlantic as to methods and rules for obtaining the true values of meter types, and on this as a basis was drawn up a "Meter Code" for the acceptance and comparison of alternating current watt-hour meters. As direct current plays a relatively unimportant part in the Commission's scheme of distribution, these tests were made applicable to alternating current meters only.

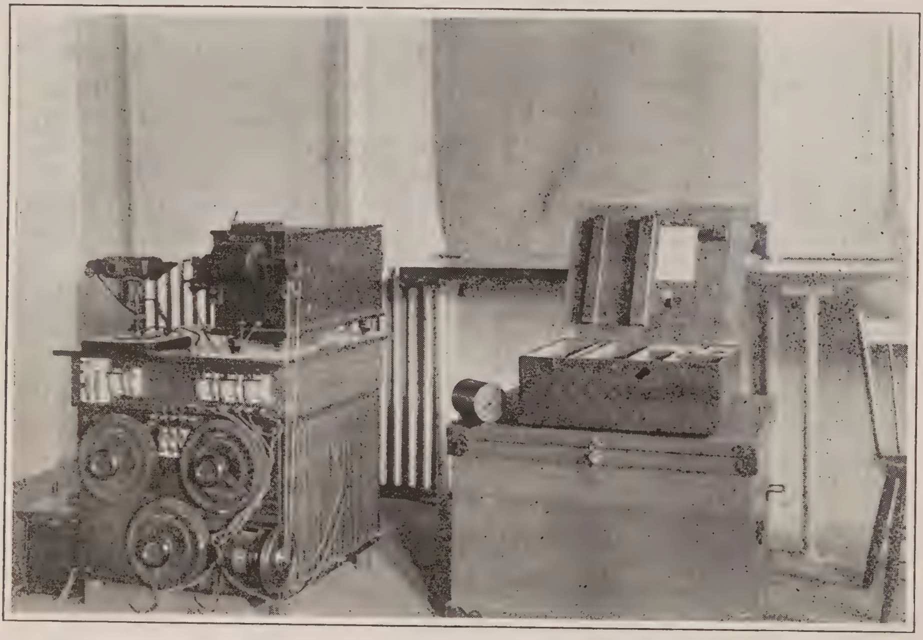
The equipment of the new laboratory is being selected and installed with the end in view that all the conditions of the tests may be complied with, and that they may be run in proper sequence. Meanwhile this department has been continuing its tests and investigations on watt-hour meters and other power measuring devices, until a position has been attained where excellent information as to the comparative values of a large number of meters is now within reach of its customers; and this will be more fully gone into and further verified when, with improved equipment, the new rules are applied. For medium sized loads, the maximum-demand meter finds a growing field, and several different makes have been tested—generally with favourable results. Graphic meters are usually considered too expensive to install and operate on any but comparatively large loads, though when properly adjusted and cared for, they furnish the ideal in commercial electrical measurement. The Meter Department is prepared to conduct the fullest tests and to make any repairs on graphic instruments.

Being equipped with a first-class oscillograph put up in a readily portable form, the Commission is able to make detailed investigations of matters affecting the wave form of current at any point on the system. This Department has from time to time done such work in this direction as has enabled the Commission's Engineers to locate, and take steps resulting in the ultimate removal of, a number of disturbing factors in the distribution system.

Under the direction of this Department, there has already been constructed a number of special devices necessary for convenient and accurate testing, and the following description of some of them may prove interesting.

For obtaining currents of varying factors, an adjustable choke coil was built. This consists of a small auto-transformer in which the magnetic circuit may be opened to any desired degree by means of a fine threaded screw operated from outside the case. In addition to this outfit, there has been assembled a phase angle board, wherein, by a combination of transformers operating on a three-phase source of potential, voltages may be obtained which are separated from each other by any desired time angle. This may also be used for producing potentials of different value required in many tests.

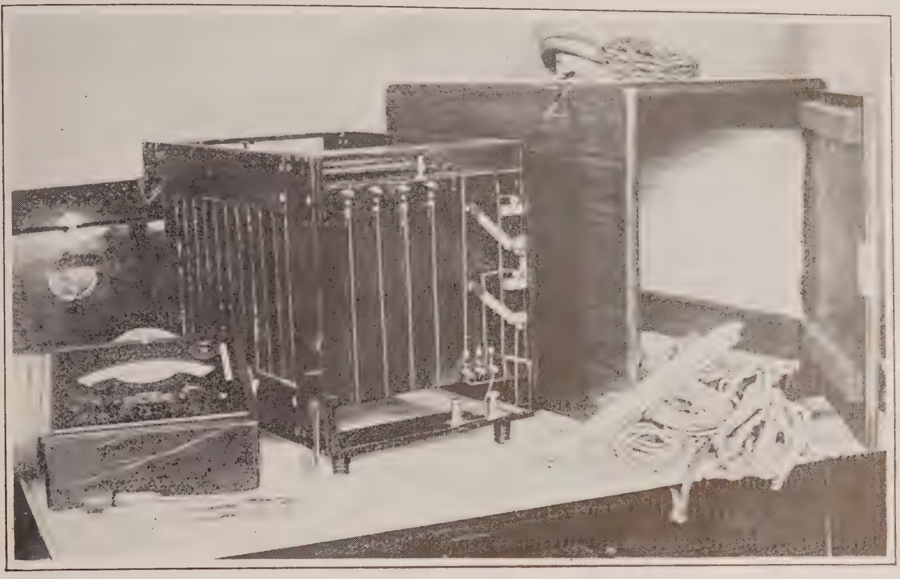
For the new meter workshop, a Rivett precision lathe has been purchased, and this in conjunction with other apparatus and equipment selected specially for this class of work, will enable the Meter Department to do the most delicate instrument work required. The Department will then take over the meter repair for



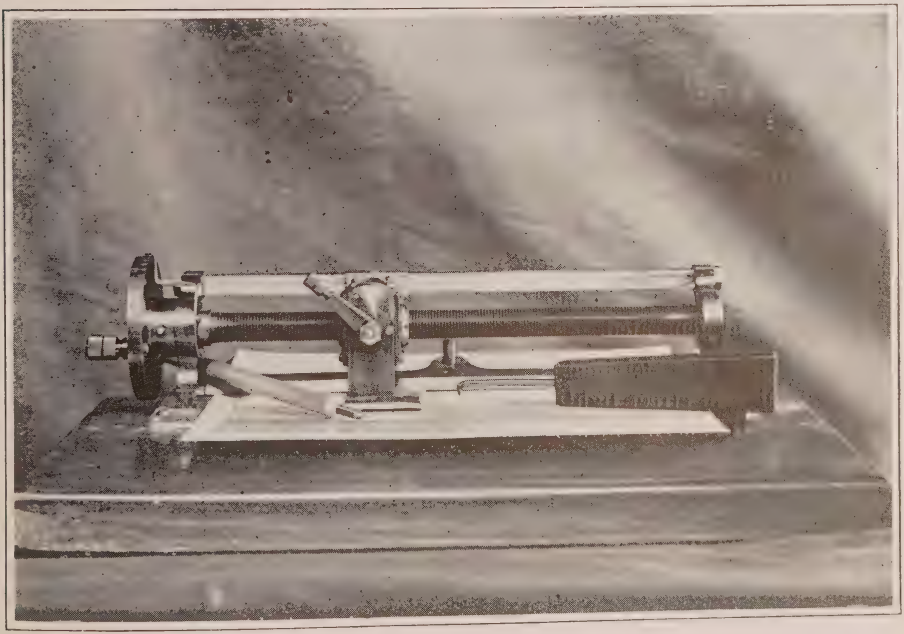
Oscillograph with its Table and Shipping Box

the entire system, and will be able to construct special devices for convenience and accuracy of making measurements, either in the laboratory or out of it. There is at present being designed specially for the use of the Commission, a Precision Watt-hour Meter, which shall be entirely free from the various sources of error inherent to the ordinary types of integrating instruments, both direct and alternating. In connection with this there will also be constructed a device for accurately counting the revolutions of meters under test, thus eliminating all possibility of personal error.

In conclusion, and as an indication of the impotance of the work undertaken by this Department to promote the highest possible degree of accuracy, it may be noted that many meter departments content themselves with an accuracy of 2 per cent. This, though amounting to little in the case of one individual meter,



Baker Potential Ratiometer



Dividing Engine

might, if allowed on the amount of power handled by the Commission, total to thousands of dollars in a year. Aside from the numerous other duties undertaken by this Department, the desirability of removing every possible source of error in the measurement of the power handled is in itself sufficient justification for the organization and equipping of the Hydro-Electric Power Commission's Meter and Standards Laboratory.

Illuminating Engineering

The improved methods of light distribution are no less noticeable than the rapid developments of light production, and that this is largely in the public mind is exemplified by the general insistence on high intensities and more artistic systems in street lighting. Considerable work has been done by the Commission towards taking data on all kinds of street lighting apparatus, and thus to be placed in a position where reliable advice and information might be given to Municipalities on lighting systems for their streets.

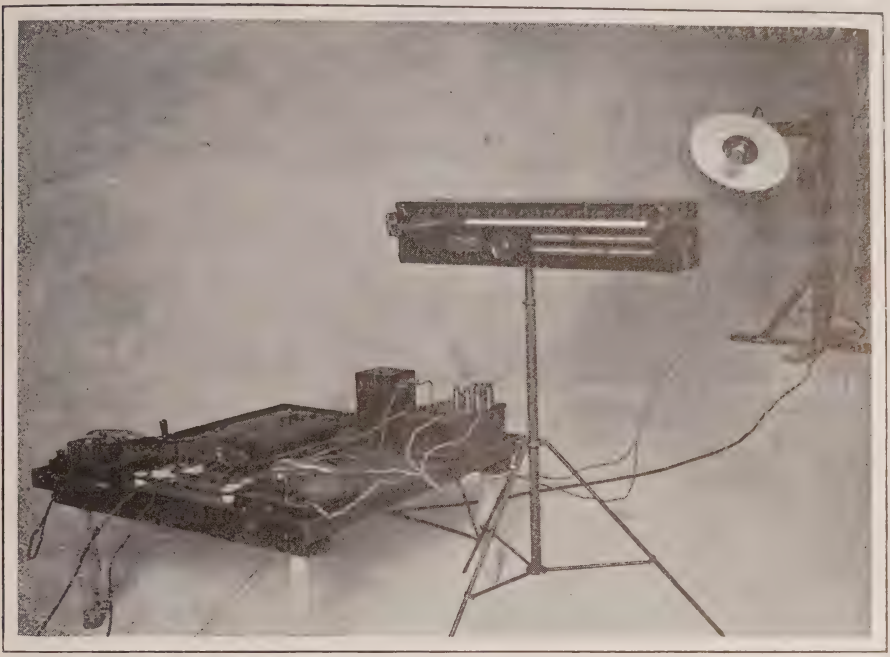
During the past summer, several Municipalities were visited, and photographs and measurements of their street lighting taken. The information which has been collected during the past two years has enabled the Commission to get accurate data, both as to the artistic value of the particular type of apparatus represented, and also the resultant illumination derived from same, including such details as the Watts per Linear and Square Foot: the average Illumination; the Maximum and Minimum Illumination; and all the features which it is necessary to consider when planning street lighting systems.

Considerable work has been done in the Laboratory of the Commission toward obtaining information on the different types of fixtures on the market designed for street lighting service. Among the different points determined, were the distribution obtained by the reflector; the absorption of the reflecting or diffusing medium; the mechanical strength or resistance to the wear and tear of service; the insulation (an important item for series fixtures) and the general suitability for service, taking into consideration the price.

The losses through absorption by dirt on reflectors or diffusing glassware, have been investigated, and information will shortly be available for Municipalities, showing the allowable length of time between the cleansing of reflectors or glassware under different conditions of street lighting service, this period being when the cost of cleaning balances up with the monetary loss due to absorption by dirt of the light generated.

Realising that the detrimental effect of glare from unshaded light sources is more noticeable in street lighting systems than in the illumination of interiors, the Commission is experimenting towards the development of a fixture which will give such a distribution of light intensity from the incandescent lamp as source, as to approximate even illumination with a ratio of spacing to height of about 4 to 1, and yet so shield the bare lamp from the range of vision that at no time should glare present itself, and thus lower the visual acuity.

Rural road lighting being a matter of growing importance, experiments are under way to develop a type of reflector peculiarly suitable for an installation of this character. It may be understood that in sparsely populated districts it is not practicable to attempt even illumination, owing to the high cost of installation which this would entail. A fixture every four or five hundred feet would probably



Method of Obtaining Distribution Measurements

A Well Illuminated Street

be the commercial limit. It is believed that the highest efficiency will be obtained with; (firstly) an asymmetrical type of reflector, confining the resultant illumination to the road proper; (secondly) a reflector having sufficient depth to totally shade the bare filament from the observer when approximately distant fifty feet from the standard; the height of the fixture being somewhere between 16 and 20 feet. The comparatively brightly illuminated area extending on either side of the fixture for 100 feet or more, presents a suitable background against which objects are silhouetted, whilst the absence of glare permits full advantage to be taken of this phenomenon.

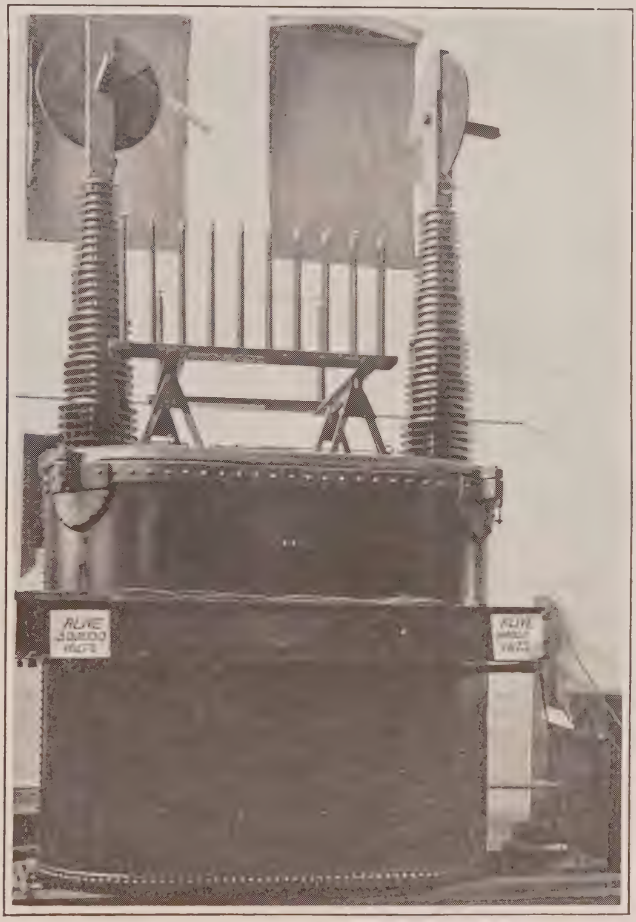
Many points with reference to street lighting systems have been discussed with the Municipalities, and recommendations made. Fixtures have been designed and suggestions made as to preferable types in new installations. It has been a difficult matter to impress the Municipalities with the fact that satisfactory illumination cannot be obtained where the ratio of spacing to height exceeds five or six to one—in other words, where poles are spaced one hundred feet, the height of the lighting fixture must approximate 15 to 17 feet. It has also been found that the tendency among municipal authorities is to lay far too much stress on the location of the fixture on the pole, so as to present a symmetrical appearance by day, rather than considering the effect of low-hung light sources by night, which results in a widely varying intensity of illumination and a glare which is much in evidence. The five-lamp cluster has continued to prove popular though recommendations have been made by the Commission against using a multiplicity of units where one lamp will accomplish the same purpose.

The pendant one-lamp standard of the "bishop's crook" type, presents several advantages, and this type has been usually adopted in continental cities. The use of a reflector is made possible where the lamp is held pendant, and as it is only in the very large cities that the buildings can bear inspection above their display windows, this type is peculiarly suitable. The "Magnetite" Arc is a strong contender against the tungsten lamp where display lighting is desired. However, the advent of the high-efficiency tungsten lamp, giving a normal life of 1,000 hours when burning at an efficiency of one half watt per candle, will place the incandescent metal filament lamp in a very strong position for both interior and exterior lighting. It is expected that this new type of lamp will be on the market within a few months, though only in lamps of a comparatively heavy amperage.

High Tension and General Testing Department

This section of the Laboratory is at present equipped with a 300-kv.a., 300,000 volt, 60 cycle transformer and a 50 kv-a., 37,500/75,000 volt, 25 cycle transformer. The former has at present a combination of generator and primary resistance control, and the latter is controlled by means of a 220 volt-1,100 volt multitop transformer or potential regulator. These potentials are used in determining the breakdown voltage by flashover or puncture of which may be submitted for test. High potential tests may also be carried out under artificial rain conditions, by means of a nozzle apparatus, which may be various types of insulators, street series lighting fixtures and other apparatus so directed as to precipitate the imitation rain at

any desired angle. During the last four months, detailed investigations have been carried on in connection with the insulator troubles that were experienced on the Commission's high-tension line. Hundreds of insulators have been tested to determine to what extent the insulating qualities are affected when they are subjected to various conditions similar to but more severe than obtain in service, such as temperatures up to 100 deg. cent., unequal heating, sudden cooling and electrical



300,000 Volt Test Transformer.

and mechanical stress. In many cases, the original designs of insulators have been modified to better conform to service conditions, as indicated by the test results.

Tests on oil used in transformers and switches are carried out for Municipalities, and the sub-stations of the Commission. The current for the oil-testing apparatus is supplied by the 25-cycle, 37500/75000 volt transformer. The potential across the gap being controlled by a multiple tap regulator on the low side of the testing transformer. Samples of oil are periodically received from the various

stations, and on completion of tests, containers are returned to sender with report of tests.

Apparatus for obtaining and measuring tensile strength of insulators, insulator pins, cable, cable clamps and sleeves, etc., up to a maximum of 10,000 lb. is installed. And complete apparatus for testing cements is being installed.

In general, it may be said that electrical and mechanical tests on line apparatus may be made in practically any desired manner, special apparatus being manufactured by the Laboratory workshops to meet any special conditions that may arise.

Lamp Testing Department

Lamp investigations have been conducted in this department throughout the past year, and the scope of the Lamp Laboratory considerably extended. Tests are conducted, not only to determine the relative quality of the different makes of lamps, but also to keep in touch with the quality of each make of lamp from month to month. During the conducting of life tests, it was noticed that some lamps showed tendencies towards undesirable behaviour along certain lines peculiar to themselves. The causes of these defects were investigated and the matter taken up with the manufacturers, who have shown willingness to co-operate with the Laboratory in eliminating as far as possible any feature detrimental to the best service of the lamp.

On life tests, all tungsten lamps are burned at the same efficiency, and are measured on the photometer at their rated voltages; measurements being taken before going on test, then after the first 25 hours, and after each succeeding 50 hours until 80 per cent. of the initial candle-power is reached. All carbon lamps are burned on the racks and measured on the photometer at the voltage necessary to bring the initial efficiency to 31 w.c.p.c., this being the rated efficiency at which, normally, carbon lamps are purchased. Life tests of the principle makes of lamps are run each month. On completion of each test, curves are plotted showing the performance of the lamps during life. The cost per 1,000 candle-hours, for each type of lamp, calculated from the results of the test, indicates which lamp is the most economical to use. This incidentally shows the relative cost of light from tungsten and carbon lamps. The following makes of lamps have been submitted for test during the year:—

Carbon Lamps

Brilliant	Rex
C.G.E.	Laco
Sunbeam	Robertson
Royal Ediswan	Premier
Chapman & Walker	Siemens
Friedman	Federal
Electrical Accessories Co.	Elec. Eng. E. Company
Watt	Central Electrical Co.

Tungsten Lamps

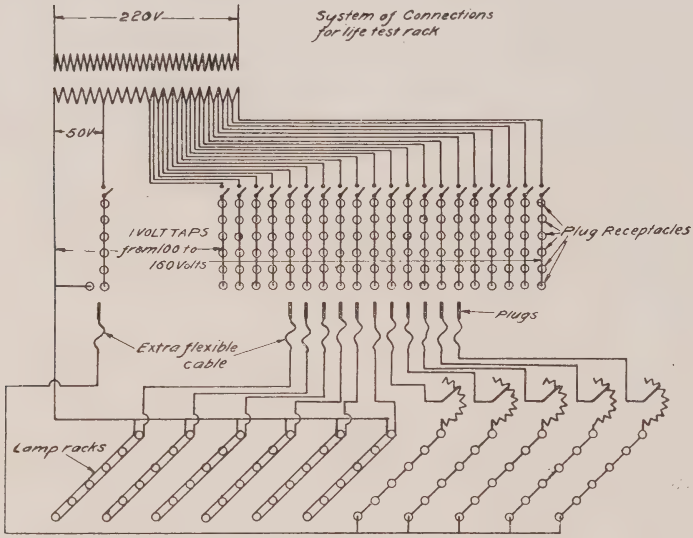
Condor	Franklin
Gwiazda	Bergmann
Edison	Westinghouse
Justram	French Palo
Laco	Graetzin
Sol	"Z"
Nulite	Medra
Volt	Lion
Holland	Monowatt
Sunbeam	Northern Light
Fedram	Wirum
Titan	Briton
Szel Import Co.	Rock
	Helios

Lamps designed for special purpose have been tested, and the claims made for them substantiated or disproved. All lamps purchased by the Commission for distribution to the Municipalities, are submitted to test according to specifications which have been issued to lamp manufacturers, the procedure being briefly as follows:—

On a shipment of lamps being received, the Lamp Inspector selects at random 10 per cent. of each size and type of lamp, and examines them for mechanical and physical defects, and tests them for vacuum and evenness of filament. The lamps are then photometered to ascertain whether or not their rating and efficiency comply with the specifications. If more than 15 per cent. of any one size or type of the lamps inspected fail to comply with the specifications, the lot represented by those lamps is rejected. Approximately two per cent. of the lamps that have passed inspection are held for life test. Lamps that pass inspection, are stamped by the Inspector with the Commission's serial number, and placed in stock. In the event of any dissatisfaction arising from the use of the lamps, the defective ones may thus be traced, and their inspection reports referred to. This method of keeping in direct touch with the quality of the lamps handled by the Commission, is of direct benefit to the Municipalities or other consumers.

In August, the temporary quarters in Toronto sub-station were abandoned, and the entire equipment moved to the new laboratory building. In the reassembling, a few changes were made, calculated to increase the rapidity and accuracy of measurements, and a number of improved devices which have been made in the Laboratory workshop were added to the photometer equipment. Both standard and test lamps may be operated on one circuit controlled by one main rheostat, with smaller rheostats for individual adjustment; or by throwing over a small two-point switch both lamps are put on entirely separate circuits, each regulated by its own rheostat. Direct and alternating current are provided for use on the photmeter. Direct current is from storage battery, and is available at the photometer at any voltage up to 300. By changing the position of plugs on the main switchboard, any desired change of voltage may be secured. Alternating current is available in both 25 and 60 cycle, and to any desired voltage, and a close regulation is obtained by means of an induction type regulator

Adjoining the photometer room, is the room containing the life test lamp racks, where provision is made for testing 144 multiple lamps, and 30 series lamps. The receptacles for the multiple lamps are arranged in 24 circuits—six in each circuit. Those for the series lamps are arranged in five circuits, and a rheostat is in series with each circuit. The power is supplied to these racks by a 25 kw. transformer, 220 volts primary, and on the secondary side taps are brought out at 50 volts, and from 100 to 160 volts in one volt steps. The transformer taps are brought to a plug board, where receptacles are connected six to each tap, thus enabling six circuits to run on one voltage. By means of jumper cables plugged



Lamp Testing Transformer Diagram

from one group of receptacles to another, any number of circuits may be run on one voltage. Any multiple circuit may be run on any voltage from 60 to 160. Any series circuit may be run on any voltage from 50 to 110, or from 100 to 160, according to the position of the plugs on the common wire, whether placed in the fifty volt tap or the zero lead. The voltage is kept constant by an automatic voltage regulator in the primary circuit. An ammeter indicates the current flowing in any series circuit and a voltmeter is connected across the primary of the transformer.

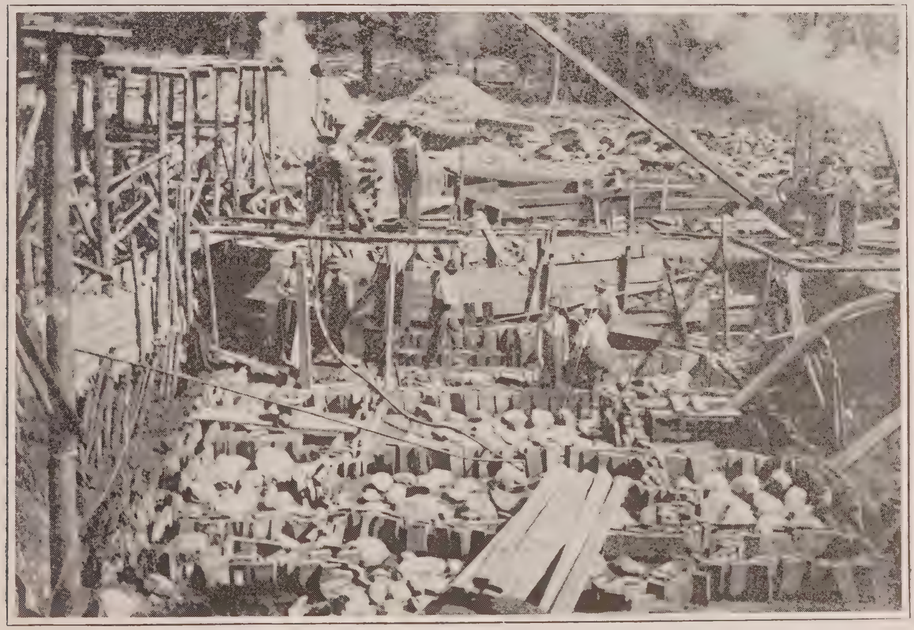
CHAPTER VI

HYDRAULIC INVESTIGATIONS

SUMMARY

Bonnechere Storage System

As set forth in previous reports, a scheme was inaugurated involving the possible ultimate construction of works to control storage on five of the principal lakes in the watershed of the Bonnechere River. The most important storage basin in this watershed is Round Lake, and the events which led up to the letting of a contract for the construction of the Round Lake dam, and the unfortunate but unavoidable conditions which obtained in connection with construction during the summer of 1912 have been mentioned in the report for that year.



Round Lake Dam—Showing Foundation Work under Sluices.

The absolutely unprecedented high water conditions which obtained during the summer culminated in a heavy flood during the first week in November, which rendered further progress impossible for the time being, and operations were suspended for the winter.

Owing to the fact that good gravel had been obtained in the immediate vicinity of the dam, the Contractor had been able to place concrete at about half the price per yard called for in his contract, and it became evident that a considerable saving in the ultimate cost of construction would be made if the work were taken over from the Contractor and completed by day labor. An agreement was therefore made with the Contractor for cancellation of the contract, on the condition that he be paid according to contract for the work already done, for the construction material delivered at the site, and for the actual cost of such coffer-dams, trestles, etc., as could be used by the Commission for the completion of the work.

During the winter of 1913, sufficient cement was purchased and teamed into the dam to complete the work, and contracts were made with local farmers for timber and cordwood to be delivered at the site in time for the resumption of work in the summer of 1913.

Work was resumed on the dam about the middle of June, 1913, and the dam was practically completed by November 1st, 1913, as the accompanying illustrations will indicate. Unlike the summer of 1912, work conditions during the past season have been extremely favorable, and the sheet piled foundations under the sluices, which it was found practically impossible to place during the season of 1912, were successfully completed, although with considerable difficulty.

The Round Lake dam is designed to hold 9 feet of water on the sills. The area of the lake as determined by the survey is practically 11 sq. miles, so that the ultimate volume of storage will be 2,450 million cubic feet. At present only 6

Round Lake Dam—Looking Down Stream.

feet of storage draft is available, or a total volume of 1,840 million cubic feet, but the ultimate volume can be obtained when necessary by deepening the outlet, the sluiceway sills having been placed with this object in view.

During September of the present year a sudden shortage of water caused an almost complete shut-down of the Municipal hydraulic plant at Renfrew and the plant of the Renfrew Power Company. The Municipality applied to the Commission for assistance, more particularly with regard to the possibility of beginning at once the construction of a dam at the outlet of Golden Lake.

An investigation showed that the above mentioned shortage of water had been caused directly by the placing of a boulder dam across the river below Golden Lake by the Indians, in order that the swift water at the lake outlet could be navigated by canoes. These boulders had been placed some days previously, and at the time of examination the lake had filled up sufficiently to discharge its normal volume, and an adequate supply of water for power purposes was once more passing down the river.

In the matter of the building of a dam at Golden Lake, it was pointed out that by the time the Round Lake dam was completed there would be three to four feet of storage impounded, and capable of being discharged in sufficient quantities to materially augment the natural flow of the river, in the event of a water shortage occurring during the coming winter. Attention was also called to the fact that a considerable volume of water could be impounded by putting temporary repairs on the lumbermen's dams at the outlets of Paugh and Clear Lakes.

The attention of the interested parties was called to the fact that Golden Lake is the proper central point for the control of the Bonnechere storage system, and before efficient regulation can be realized a dam at the foot of Golden Lake is necessary. The Golden Lake dam should therefore be a permanent and well built structure, carefully designed to meet the requirements of central control, and for this reason it would not be good policy to rush into any hasty or ill-considered

Round Lake Dam—Looking Up Stream.

scheme for the immediate construction of a dam at Golden Lake, but rather to make all necessary surveys and prepare plans with the least possible delay, in order that the dam might be built during the next low water season, in the event of the interested parties then considering such procedure necessary or advisable.

A memorandum covering the above points was left with the Chairman of the Waterworks and Power Development Committee, and under date of October 3rd a formal resolution was forwarded to the Commission asking that a complete report with plans, specifications and estimates covering the construction of a suitable storage dam at Golden Lake be submitted to the Municipality, and that any surveys necessary in connection with the preparation of such report be made with the least possible delay.

In order that the request of the Municipality may be complied with, a suitable site for the proposed dam must be located and a traverse made of Golden Lake, in order that the practicable range of level variation may be determined and flooding rights procured. This work will be done during the coming winter.

County of Bruce

For some three years past we have been making a study of the power situation of the County of Bruce, with a view to working out some scheme whereby the municipalities in that county might be served with Hydro-electric power. This investigation has embraced the examination of hydraulic power sites already developed, and undeveloped power sites on the Saugeen River, but owing to an unfavorable combination of conditions, no feasible scheme of development or distribution has yet been devised.

The Saugeen Light and Power Co. has hydraulic plants at the present time near Southampton and Walkerton. They are both low head developments, and neither development has any attractive features from an hydraulic standpoint, nor would either of them be suitable sources of power for the district as a whole. For this reason, our efforts were directed chiefly towards working out a new and more extensive scheme of hydraulic development. In this connection, preliminary surveys of two possible power sites were made in the neighborhood of the towns of Southampton and Port Elgin, but the facts disclosed by these surveys indicated that the market possibilities of the district were not such as to justify the heavy expenditure which the development of either site would have involved.

In the hope of ultimately working out a feasible scheme for the County of Bruce, the investigations on the Saugeen River are still in progress, so that the absolutely essential data in connection with the flow characteristics of the Saugeen River will be available when the opportunity arrives to formulate a definite scheme.

Crown Leases

Under the terms of the Water-Power Lease issued by the Department of Lands, Forests and Mines, the plans and specifications covering the development of any power site owned by the Province must be approved by the Commission as a condition governing the issue of the lease. The most important matter dealt with under this head during the past year was the development of the Abitibi Pulp and Paper Co., at Iroquois Falls, on the Abitibi River. This scheme involved the building of a large power plant and pulp mill at Iroquois Falls, and the construction of a storage dam at the outlet of Lower Abitibi Lake. The power plant and mill are both under construction at the present time, in accordance with approved plans and specifications, and the works are being inspected from time to time.

The first visit of inspection was made on August 6th, 1913, subsequent to notification by the Company that a portion of the site of the main dam had been unwatered. This inspection was made primarily with the object of determining the nature of the bottom. The second inspection was made on September 9th, 1913, when construction was slightly further advanced. Reports covering these inspections are appended.

A report with plans covering the development of power at High Falls, on the Madawaska River, was submitted to the Commission for consideration before the issue of a lease to the parties interested. This report was found to be open to serious criticism in many respects, more particularly as regards the basic data upon which the final conclusions were based. A recommendation was therefore made that the granting of this lease be held over until such time as the applicants had supplied the additional information which was considered necessary.

Engineer's plans and specifications covering development on the York River by the Canadian Marble Co. were submitted for approval. Neither the report nor

the plans were approved primarily, by reason of the fact that the power capacity of the site was largely over-rated, and also because the plant was not designed in the best interests of economy and efficiency.

A second set of plans and specifications was then submitted embodying the changes recommended by the Commission's engineers. The revised plans and specifications were approved.

Dog Lake

Under date of February 20th, 1913, a letter was received from the Commission of Utilities, Port Arthur, transmitting the following resolution of the City Council:

"That the letter of the Commissioner, dated February 17th, *re* development of Dog Lake, be received and filed, and that he be authorized to make application on behalf of the City of Port Arthur to the Hydro-Electric Power Commission of Ontario for a detailed report on the development at Dog Lake for power purposes; said report to give the estimated capital cost and annual charges, and the available horse-power that could be developed, with the annual cost of 24 hour power at the low tension busbar step-down transformer station."

A copy of this resolution was also officially forwarded to the Commission under date March 3rd, 1913, by the Clerk of the Municipality.

Under date of February 4th, 1908, the firm of Smith, Kerry and Chase submitted a report to the City of Port Arthur in connection with the development of power at Dog Lake. The scheme of development covered by this report involved the construction of 5,400 feet of tunnel through the height of land between Big Dog and Little Dog Lakes. Extensive exploration work along the line of this tunnel by means of test pits and borings, showed nothing but fine gravel and sand, rock being nowhere in evidence. As very complete surveys were made in connection with this report, it was not considered necessary to give further consideration to the tunnel scheme of development as far as the field work was concerned.

Owing to the fact that the tunnel would require to be driven through sand and gravel, Messrs. Smith, Kerry and Chase provided in their estimates for the construction of cut-off walls at various points along the line of the tunnel, in order to prevent seepage along the course of the same. The possibility of leakage along the line of the tunnel is a matter requiring very serious consideration, for once started it could not be stopped, and the result might be the ultimate destruction of the works.

The topographical conditions at Dog Lake are such as to permit of development by means of a contour pipe or flume in place of the tunnel. Cursory inspection of the ground was not sufficient to definitely determine whether the flume method of development would be more expensive or less efficient than the tunnel scheme, but it would have the advantage of eliminating altogether the very serious hazard mentioned above in connection with the tunnel.

It was therefore considered advisable to have this alternative scheme of development carefully looked into, and with that end in view a party left for Dog Lake on September 9th, 1913, to make the surveys which will be necessary in order that a final report and comparative estimates on the two schemes may be submitted to the Municipality of Port Arthur.

This survey is still in progress and will be completed probably towards the end of November, 1913.

Fort Frances

Under date of June 11th, 1912, the Municipality of Fort Frances applied for an investigation as to the possibility of developing power at Foot Print Rapids, in sufficient quantities to supply the requirements of the Municipality.

In accordance with this request, a survey was made during the month of September, 1912. The conditions at the Foot Print Lake site were found to be such as to make it unsuitable for the purpose required, both as regards capacity and the cost of development, and as an alternative proposition a preliminary survey was made of a power site at Sand Island Falls, at the mouth of the Big Turtle River. Upon completion of the survey, a preliminary report, appended hereto, was prepared and submitted to the Municipality.

Grand River Improvement

Subsequent to the completion of the reconnaissance survey of the Grand River watershed mentioned in the Commission's report for 1912, a preliminary report, appended hereto, was submitted under date of March 31st, 1913, covering a proposed scheme of artificial storage and flood control on the Grand River, and outlining the scope of the field work which would be necessary in order to prepare a final report and set forth a definite scheme of procedure.

Following the recommendation of this preliminary report, an exhaustive study of the flow characteristics of the Grand River and its tributaries was begun in June, 1913, and at the present time gauging stations are established on the Grand River, and gauge recorders employed at each station to take readings of water level twice a day from gauges established. This work has now been carried through one low water season and some valuable information obtained. There has so far been a reasonably close relationship between gauge height and discharge. This satisfactory relationship has been mainly the result of low water conditions, and there is unfortunately no likelihood that similar conditions will obtain during high stages of flow, when the gauges will be unavoidably affected by back-water.

In anticipation of the effect of back-water upon the gauges, a line of levels was run up the Grand River valley as far as Bellwood, and for several miles up each of the main tributaries. The work was started at Dunnville, using the U.S. Lake Survey level of Lake Erie as a datum. Permanent bench marks referred to sea level were established at convenient intervals on the main stream and tributaries, as per the tabulation appended.

During the course of the work all accessible Geodetic Survey bench marks were picked up, and in every case a very satisfactory check was obtained. A reasonable check was also obtained on various railway elevations.

All the gauges from which water level readings are being taken on the Grand River and tributaries are set from these bench marks, consequently all gauges are set to the same datum throughout the watershed, and slope data can be taken directly from the gauge readers records. With the help of this slope data it is hoped that it may be possible to apply corrections to the gauge readings during high stages of flow, and thus eliminate to a large extent the effect of back-water.

Lake of the Woods

The negotiations between the United States and Canada relative to the water level of the Lake of the Woods, which came up for consideration under Article 9 of the Boundary Waters Treaty between Great Britain and the United States, are still under way, and final judgment of the Commissioners is being held pending

the receipt of the report of the consulting engineers of the Commission and the associate engineers of the various Government Departments involved. The collection of data has involved an immense amount of difficult field work, including flood damage surveys on the shores of the Lake of the Woods, storage surveys of the lakes lying along the International Boundary tributary to the Rainy River, and reconnaissance surveys of the secondary storage basins lying wholly within the boundaries of either country.

The field work in connection with the first two items, being on International waters, was carried on directly under the supervision of the engineers of the Joint Commission by field parties consisting of engineers and assistants appointed by Canada and the United States.

The investigation of secondary storage basins was carried on as a wholly domestic enterprise, and in the case of Canada the work was done by the Hydro-Electric Power Commission.

In connection with the work on the secondary storage basins, the possibility of making an instrumental traverse of the more important lakes was first considered, and to this end one of the Commission's engineers was sent north on December 27th, 1912, acting under instructions contained in the memorandum quoted below:—

"The object of your trip west is briefly to determine the ways and means of carrying on a winter survey of certain lakes in the Rainy River District. If possible, these lakes are to be traversed and the shore lines located with reasonable accuracy by means of triangulation and stadia. The lakes primarily involved are Lac des Milles Lacs, White Otter, Clear Water, Otukamamawan and Upper and Lower Manitou.

"From the maps at present available it would appear that Lac des Milles Lacs can be worked best from Savanne on the C. P. R., but the topographical map shows a winter road running into Baril Bay from the C. N. R., about two miles east of Huronian Station.

"White Otter and Clear Water Lakes could be worked either from Ignace on the C. P. R., or from Atikokan, on the C. N. R.

"Otukamamawan Lake can apparently best be worked from Mine Centre, on the C. N. R.

"Manitou Lake can apparently best be worked from Dinorwic or Wabigoon. There is a Hudson Bay store at Dinorwic.

"The matter of first importance which you are to determine is which, if any, of the above points would be the best to use for working the various lakes. To reach a decision in this matter you will require to consider the following points:

1. "The facilities for purchasing supplies and the names of parties from whom such supplies can be purchased.

2. "The facilities for hiring teams or dog trains, the names of parties from whom they can be hired and the probable price.

3. "Information as to the location of winter roads from the various supply bases chosen.

4. "Information as to the location of lumber camps on the various lakes to be worked.

5. "Information as to the location of deserted camps on the various lakes which might be used by survey parties.

6. "Information as to the possibility of hiring help at the various supply bases chosen.

7. "Information as to whether the weather conditions up to the present time have been such as to make the lake and bush roads suitable for team travel."

The report in connection with the above was submitted under date January 8th, 1913, in which it was set forth that Lac des Milles Lacs should be worked from Savanne, Upper and Lower Manitou Lakes from Wabigoon, Otukamamawan Lake from Mine Centre, and White Otter and Clear Water Lakes from Banning on the C. N. R.

Information was also submitted with reference to the purchase of supplies, hiring of help, etc.

The above report, considered in connection with data obtained from various maps covering the district indicated that, apart altogether from the great expense involved, it would be almost a physical impossibility to complete traverse and shore line surveys on these lakes within the time available for the work.

Investigation at Ottawa also disclosed the fact that compass and micrometer surveys covering most of these lakes had been made many years ago by the Geological Surveys Department of the Department of the Interior. These surveys plotted to a scale of one mile to the inch supplied with a sufficient degree of accuracy most of the information which the proposed winter surveys were intended to supply. This being the case, it was always possible to obtain much more accurate information as regards back-water damage and sites for storage dams during the summer season.

An engineer was accordingly sent west on August 1st, 1913, to cover the district involved in the investigation. His report covering storage capacity, possibility of back-water damage, and conditions at the outlets of the various lakes is appended hereto.

It may be mentioned that, in view of the immense storage capacity of the Lake of the Woods, Rainy Lake, and the chain of international lakes above Kettle Falls, it is unlikely that the lakes covered by the above mentioned report will ever require to be regularly used in connection with any general scheme of regulation necessary to control the levels of the Lake of the Woods. These lakes, if used at all for storage purposes, will be used more in connection with local power projects, and will not be so important as factors in the regulation of the International waters below.

Muskoka River Storage

For some years past the Town of Bracebridge has been suffering seriously during the low water season for lack of sufficient water to operate its hydraulic plant on the north branch of the Muskoka River, the conditions on several occasions being such that for weeks at a time hardly more than one-third of the connected load could be carried. Investigation indicated conclusively that the only means of preventing the continued recurrence of these conditions was by artificial storage.

From the standpoint of capacity, accessibility and efficiency of operation, the four large lakes above Port Sydney offered by far the best opportunities for artificial control.

The level of these lakes is now controlled by the Provincial Department of Public Works for navigation purposes, by means of a dam at Port Sydney at the foot of Mary Lake, and a lock and dam in the river between Mary Lake and Fairy Lake.

A proper study of the problem therefore involved consideration of the interests of navigation, and before taking any definite steps to assist the Municipality of Bracebridge, a communication was addressed to the Department of Public Works asking if the co-operation of that Department could be counted on in laying out some scheme by which the above mentioned lakes could be controlled to the advantage of the combined interests of navigation and power, and upon receiving the assurance of the Department of Public Works that its assistance and co-operation would be forthcoming, a party was sent into Port Sydney in the early part of January, 1913, to make the necessary surveys. The work was not completed when

Wasdell's Falls—Wheelpit Excavation Showing Nature of Foundation Material.

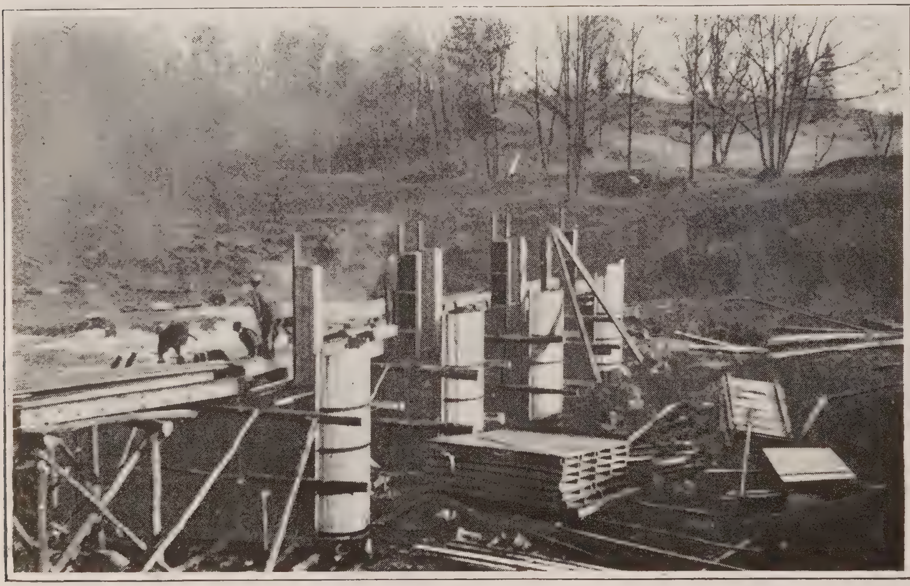
the spring break-up occurred, and some additional work was necessary during the summer. Subsequent to the completion of the surveys, a report was prepared which is now in the hands of the Minister of Public Works, and it is anticipated that a scheme will shortly be worked out, whereby the serious power situation in the Town of Bracebridge may be permanently relieved without injury to navigation.

Ontario County

Pursuant to the applications of the various municipalities in the County of Ontario, as set forth in the report for 1912, Enabling By-laws were passed in November, 1912, by the Municipalities of Woodville, Sunderland, Cannington, Beaverton and Brechin, and signed contracts were subsequently received from these municipalities covering the supply of 625 h.p., it having been previously determined that the power site at Wasdell's Falls on the Severn River was the only source of power from which these municipalities could be economically

served. Detailed investigations were immediately instituted upon execution of the above contracts, and estimates covering the cost of delivered power were submitted to the municipalities and found acceptable. Thereupon, the Commission, acting under authority of the Power Act, immediately forwarded to the Government a recommendation for the immediate issue of an Order-in-Council covering the purchase of the site and the development of power at Wasdell's Falls.

Although hydraulic investigation relative to this scheme had been under way for some time, no work had been done in connection with the power development itself, but immediately upon issue of the Order-in-Council under date of April 21, 1913, work was begun upon plans and specifications for the hydraulic portion of the plant. Tenders for the construction of the dam and power-house were called for June 16th, 1913, and tenders for the hydraulic equipment for June 20, 1913. The various contracts were awarded as follows:—



Wasdell's Falls Construction—Main Dam—September.

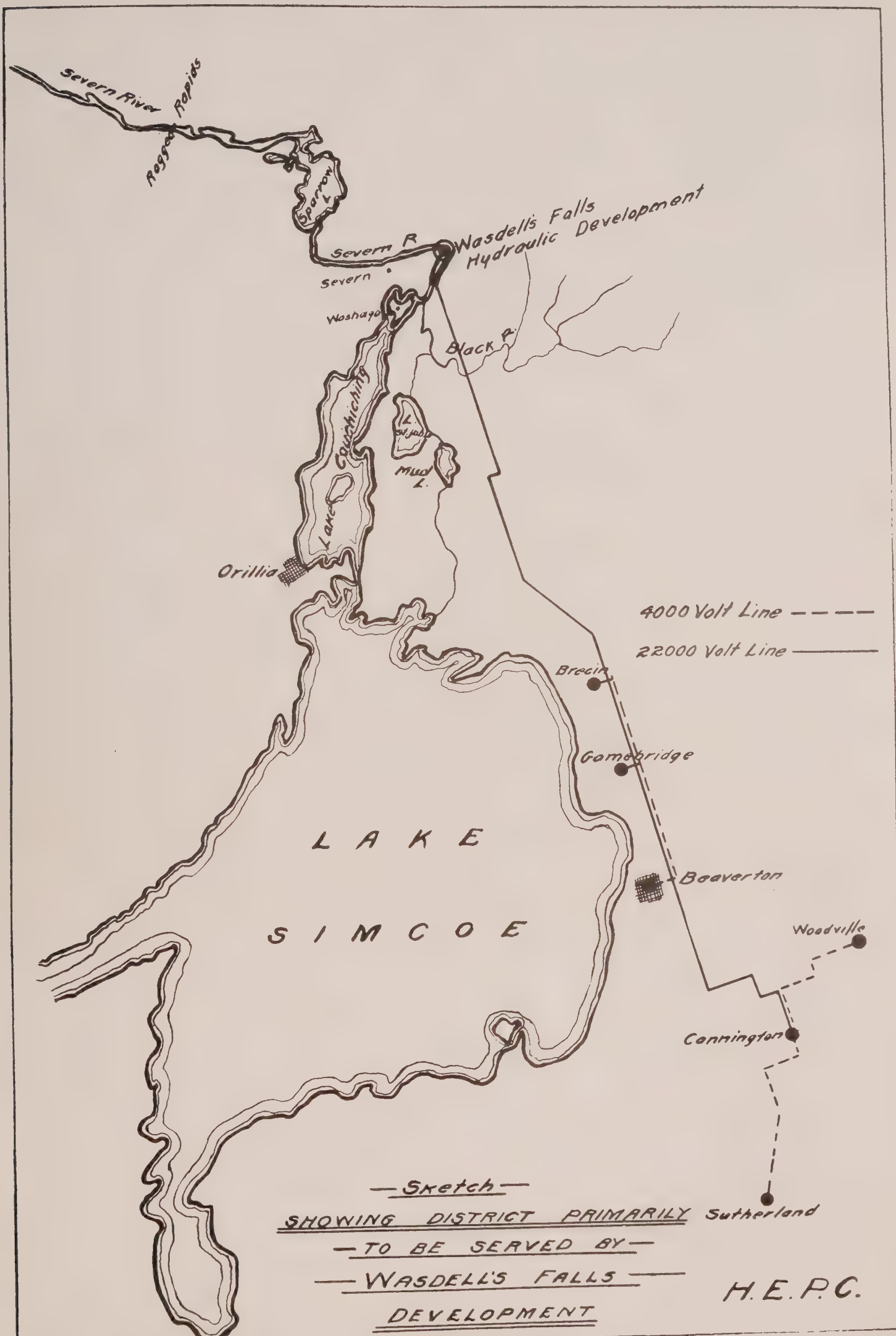
Dam and power-house—Galbraith & Cate, Montreal.

Turbines—Boving Co. of Canada, Toronto.

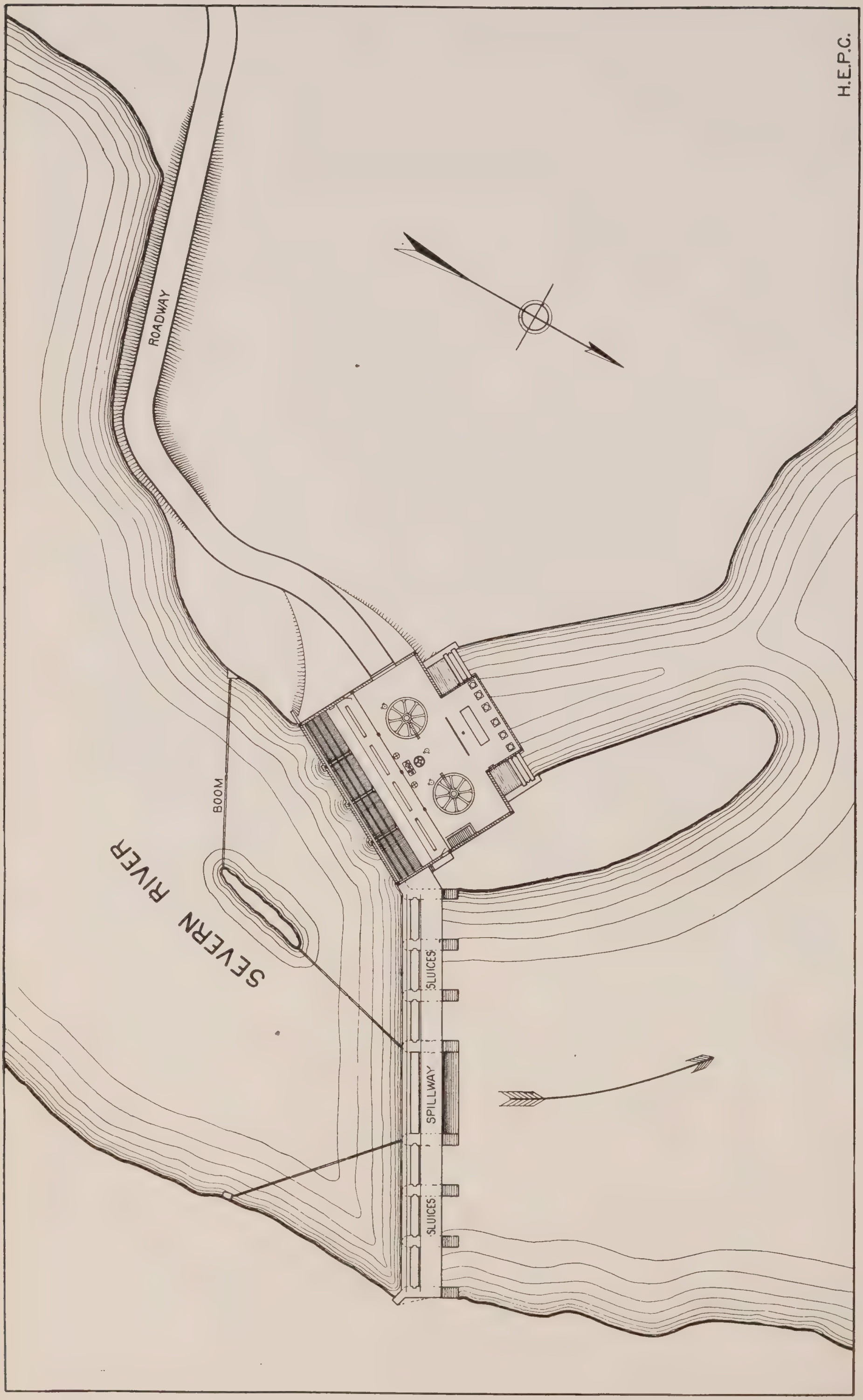
Stop-log winch and head-gate lifting mechanism—Wm. Kennedy & Sons, Owen Sound.

Crane—W. D. Beath & Son, Ltd., Toronto.

As regards the dam and power-house contract, the greater portion of the month of July was taken up by the Contractor in the purchase of plant and the installation of same at the site of work, and it was not until the middle of August that construction work was well under way. Since that time, however, good progress has been made, as the illustrations herewith submitted indicate, and there is every reason to anticipate that under the worst conditions likely to obtain the work will be beyond the reach of the high water of 1914, and with reasonable working conditions the entire works will be completed in May, 1914.



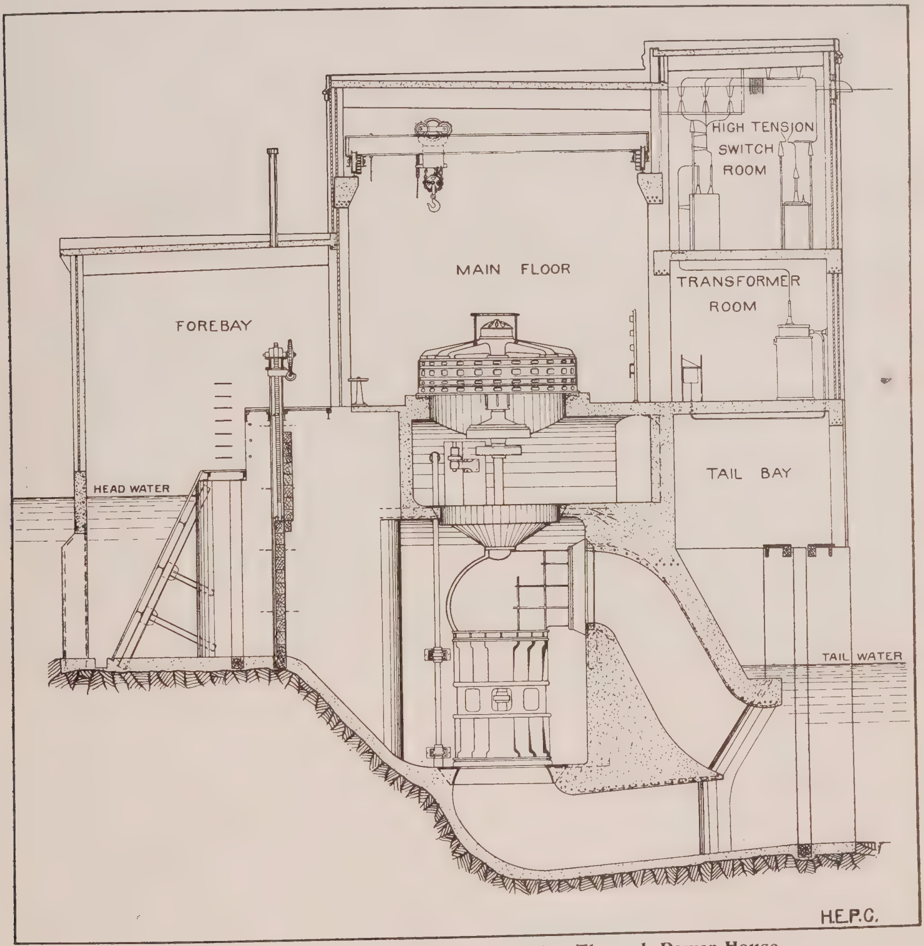
Wasdell's Falls—General Scheme



Wasdell's Fall's Development—General Lay-out.

The contracts entered into with the above municipalities do not by any means represent the extent of the market which the Wasdell's Falls development will serve. It is confidently expected that a large rural load will be developed in the flourishing agricultural townships of Mara, Thorah and Brock, and that the demands of these townships will practically double the present contracted load.

Apart from the low head, the topographical conditions at Wasdell's Falls are favorable for development purposes, and the value of the site as a source of power will be doubled when the dams incidental to the Trent Canal construction



Wasdell's Falls Development—Cross Section Through Power House.

are built across the outlets of Lake Simcoe at Washago, which is less than three miles above the plant, making the immense storage capacity of Lake Simcoe during available low water periods. The hydrometric studies made in connection with this scheme are detailed in a report on the Severn River, appended hereto.

Owen Sound District

For some time past the Commission has been endeavoring to work out a feasible scheme whereby electric power might be supplied to the Town of Owen Sound and the surrounding district.

In the Annual Report for 1911, it was stated that the best local source of hydro-electric energy for this district was Eugenia Falls on the Beaver River, at present owned by the Georgian Bay Power Co., and a report was prepared (Report No. 17, Annual Report of 1911) based on such data as was then available, demonstrating the value of Eugenia Falls as a source of power. This report indicated that the site had a commercial capacity of about 2,000 h.p. under natural conditions, and about 4,000 h.p. if the total run-off of the watershed could be artificially controlled.

The success of any scheme of development at Eugenia Falls was dependent, to a large extent, upon the amount of power which could be used in Owen Sound, and upon the willingness of the Municipality to enter into a contract for the

Wasdell's Falls Construction—Main Dam—October.

supply of same. The Town took no definite action in connection with the matter until early in the present year, when the Light and Power Commissioners of Owen Sound opened negotiations with the Commission, with a view to ascertaining under what conditions they could obtain a supply of power, having special reference to the possibility of obtaining it from Eugenia Falls. After considerable discussion it was finally agreed that the Town of Owen Sound would enter into a contract with the Commission, if it could be proved to the satisfaction of the Municipality that Eugenia Falls was capable of supplying the necessary quantity of power. In this connection, the Light and Power Commissioners asked for further confirmation of the data submitted in the above mentioned report of 1911. While the Commission was satisfied to base its findings upon the 1911 report, it was nevertheless decided to accede to the request of the Municipality, and to this end a sharp-crested weir was built at Eugenia Falls, and a recorder employed for the purpose of making continuous measurements of flow. The Light and Power Commissioners wished particularly to be assured that the records of low water flow, as set forth in the report of 1911, be confirmed, and it so happened that the summer of 1913 was one of the driest on record in that district, so that

the results of the 1913 measurements are of great value as indicating the low water power capacity of the Eugenia Falls site. The details of the 1913 investigation and the comparison of the same with the results set forth in the 1911 report are dealt with in the appended report on the Beaver River. This report indicates that the contentions of the Commission's Engineers were sustained, and the results were sufficiently satisfactory to the Town of Owen Sound to justify the Municipality in entering into a contract with the Commission for the initial supply of 1,200 h.p., the same being executed under date of October 27, 1913.

Immediately following the execution of the above contract, the Commission made application to the Government for an Order-in-Council authorizing the

Wasdell's Falls Construction—Completed Piers—Main Dam.

Commission to purchase the works, assets, real property and rights of the Georgian Bay Power Co., together with such additional rights as might be necessary, and to develop power at Eugenia Falls and distribute same to the various municipalities in the Owen Sound district. The required Order-in-Council having been issued, the work of making a final survey of the site was commenced immediately and preparations made to proceed with the design of the plant. This work is in progress at the present time.

In connection with this development, it may be mentioned that the projected scheme calls for an operating head of 500 feet. With the exception of one or two plants in British Columbia, this will be the highest head in existence in Canada.

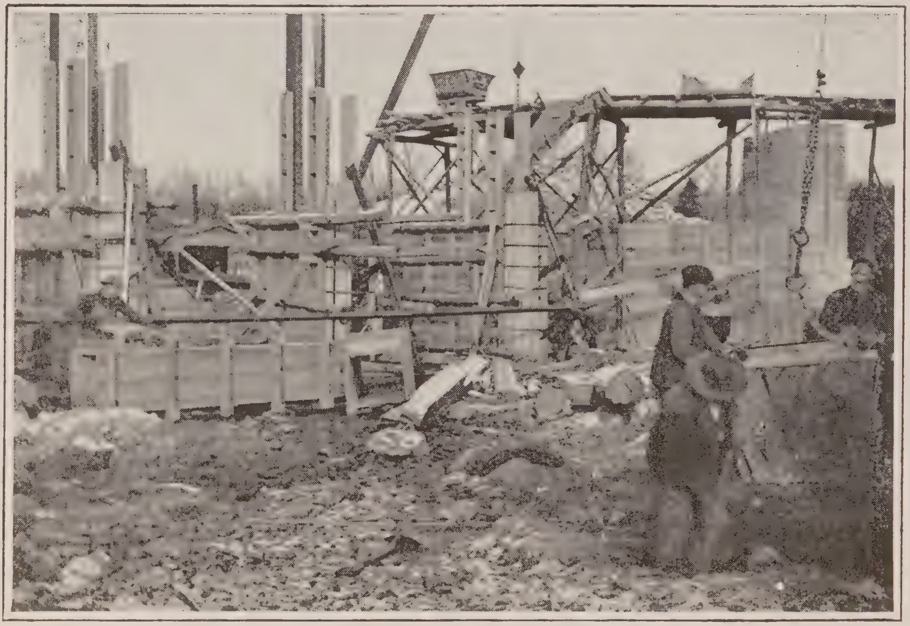
ABITIBI PULP AND PAPER COMPANY

On August 6th the site of the development of the above Company at Iroquois Falls was visited and construction work found well under way with about 350 men employed.

The T. & N. O. Railway has steel laid within a mile of the plant and grading is proceeding rapidly.

The discharge of the river at the present time is about 4,700 second feet and little difficulty is being experienced with unwatering, the coffer-dam which went out last Spring having been replaced.

The coffer-dam below the Falls which is being placed to unwater the tail-race is finished with the exception of the puddling. This coffer-dam is com-



Wasdell's Falls Construction—Form Erection for Forebay Arches and Inlet Piers.

posed of a single line of cribs clay puddled on the outside. On August 12th, the space inside this dam had been unwatered, but during the night the water broke through and filled the dam. This accident was due solely to the method of construction used, as the clay puddle on the outside of the cribs is absolutely unprotected and is being continually washed away by the current which runs parallel to the face of the dam. It would be much more economical to have placed a double line of narrow cribs with puddle between.

It is said that the rock at the foot of the reef under the grinder room is at least 15 feet lower than was expected, and perhaps more so, as there appears to be clay and gravel on the bottom. This may necessitate the moving of the power-house 15 or 20 feet up-stream so that the tail-race piers and draft-tubes, etc., may be set on solid rock within reasonable limits of cost.

No work is being done on the main dam yet, and the resident engineer stated that it would be some months before they would touch the dam. It seems altogether likely that this portion of the work will not be commenced until next spring.

Excavation for the other buildings on the shore is progressing and the foundations of the screen room are being placed. This portion of the work, however, does not concern the Commission as regards approval of plans, but it will be necessary to keep in touch with the work on the main dam and power-house foundations.

August 15, 1913.

Abitibi Pulp and Paper Company

The works of this Company at Iroquois Falls were visited on September 9, 1913, at which time the site of the power-house, tail-race and grinder room was completely unwatered. One small pump was handling the leakage through the coffer-dam, which was remarkably small.

Since the last inspection, a section of the coffer-dam on the river side which had previously sprung a bad leak, had been strengthened and protected by means of an outer crib. This outer crib prevents the erosion of the puddling clay, so that in all probability little further trouble need be expected with water at this point.

Below the rock ledge, on which the power-house will be placed, and where the tail-race piers are located, the unwatering has disclosed a condition which was previously reported as likely to obtain. The Falls here appear to have worn a huge hole in the rock, and at the time of inspection the Company's Engineer had not been able to find rock bottom in the depression. The natural bottom which is composed of loose rock, boulders, sand and clay, is at about elevation 750 with possibly 20 ft. to solid rock below.

The Company's Engineer states that they intend to fill this hole with a timber mat, upon which the tail-race piers will be built. The crib work will be securely tied together in such a way as to adequately provide against the possibility of scour at the bases of the piers.

In the vertical rock face below the power-house a certain amount of leakage was noticed, which evidently came through fissures in the bed rock. Until the surface rock has been stripped from the power-house site, it will be impossible to ascertain whether or not this leakage will cause serious trouble.

On the right bank of the river it is understood that the Company is going to place a clay fill between the end of the dam and the crest contour.

The proposed method of providing a foundation for the tail-race piers is not open to serious objection provided the crib-work is properly designed and carefully placed.

The Company should be required to place a concrete core wall or parallel rows of sheet piling with a concrete toe in the clay fill which they propose to place on the right bank. Either one or other of the above means is absolutely necessary to prevent saturation of the material, which in the case of clay would be sure to cause sliding and ultimate collapse. It is probably the intention of the Company to place the core wall or sheeting as recommended, but it would be advisable to bring the matter to their intention.

Toronto, September 30, 1913.

FORT FRANCES

Under date of June 11th, 1912, the Municipality of Fort Frances forwarded a resolution of the Council requesting a report on matters relating to the development of power at Footprint Lake and the cost of such power delivered to the Municipality.

The extent of the watershed tributary to the outlet of Footprint Lake indicated without further investigation that no considerable quantity of power could be developed unless the water could be used under a head of 100 feet or more. An examination and survey of the site in September, 1912, disclosed the following facts:—

1. That the difference in level between Footprint Lake and North-west Bay was about 41 feet.

2. That Footprint Lake could not economically be raised to such an extent as to materially increase this difference in level.

3. That of the total difference in level between Footprint Lake and North-west Bay only the upper 30 feet down to White Horse Rapids could be considered as capable of commercial development.

4. That the development of such a head would require a dam and intake works at Footprint Lake and approximately 4,500 feet of flume or pipe-line, constructed over an extremely difficult and unfavorable route.

The discharge of the stream, measured at the time the site was examined, amounted to 255 second feet. The river was not at minimum stage at that time, and taking the watershed area into consideration, a minimum flow of 150 sec. ft. would be a liberal estimate.

This would make the continuous minimum capacity of the site 400 h.p.

In view of the above it is evident that the Footprint Lake site cannot meet the demands of the industrial development which the Town of Fort Frances has in mind, and no further consideration of the same is necessary.

The above situation was anticipated before an examination of the site was made, and it was thought well to propose, if possible, an alternative scheme, which would more adequately meet the probable requirements of the Municipality. It was determined in this connection that Sand Island Falls was worth investigating. This site is located at the outlet of Little Turtle Lake and has a tributary watershed of about 1,750 sq. miles according to the best available maps. This is nearly four times the area tributary to Footprint Lake, so that the advantage as regards available flow is at once evident.

An examination and survey of the site at Sand Island Falls disclosed the following facts:—

1. That topographical conditions made it impracticable to carry the discharge of Little Turtle Lake across the portage into Redgut Bay, this having been the anticipated scheme of development.

2. That the feasible scheme of development would require the construction of a dam at the crest of Sand Island Falls of sufficient height to control the level of Little Turtle Lake.

3. That such scheme of development would make available an average head of 30 ft., and would control storage on Little Turtle Lake, which appears to have an area of about 12 sq. miles.

A measurement of flow out of Little Turtle Lake at the time the site was examined showed a discharge of 542 sec. ft. The probable minimum natural discharge will be in the neighborhood of 350 sec. ft. but with Little Turtle Lake controlled, a minimum discharge of 400 sec. ft. might reasonably be expected. With a 30 ft. head the Sand Island Falls site would therefore produce about 1,000 electrical horse-power under minimum conditions.

It should be noted that Big Turtle, Clearwater and White Otter Lakes provide exceptional facilities for artificial storage. The proper regulation of these basins should be such as to produce 100 h.p. per foot of head at Sand Island Falls, making the ultimate continuous capacity of the site 3,000 h.p.

The general hydraulic features of this scheme indicate, without the necessity of estimating, that the cost of generated power on the switchboard will be reasonable. When the cost of power delivered at Fort Frances is considered, however, it will be found that the advantages of low generation cost will be largely discounted by the addition of the transmission charge. The distance from Sand Island Falls to Fort Frances by the shortest feasible route is about 43 miles, and the topographical and geological conditions are such as to make line construction difficult and expensive.

In view of the above, the evidence of the appended estimate was not necessary to prove that the cost of power delivered to Fort Frances from any site on streams tributary to Rainy Lake could never under any circumstances compare favorably with the final cost of power developed at Coochiching Falls.

Owing to lack of knowledge as to the probable cost of installing storage works in the upper watershed, the initial development of 1,000 h.p. is the only one which could be safely considered in an estimate. It may be considered as certain, however, that the final cost of 3,000 h.p. delivered in Fort Frances from the maximum development would be considerably less than the cost incident to the delivery of 1,000 h.p. as hereunder submitted.

In conclusion, it is to be noted that the function of this report is advisory only, and the estimate is not a working estimate. The facts and figures submitted are believed, however, to be of sufficient accuracy to allow of a definite decision as to the commercial merits of the scheme as a whole. Should the Municipality wish to proceed with development on the strength of these findings, detailed surveys and a more or less prolonged course of hydrographic study will be necessary for the preparation of working estimates for the confirmation of this preliminary report.

The estimate below covers the preliminary installation of 1,000 h.p. capacity with foundation construction for an ultimate capacity of 3,000 h.p. Spare transformer capacity is provided, but no spare generating or transmission capacity.

A temporary peak load of 1,200 h.p. can be carried at the delivery end of the line, and if power is sold in Fort Frances under 20 minute monthly peak contracts, a connected load of 1,300 h.p. could probably be carried. Power to be transmitted at 22,000 volts.

Estimated Cost of Generating Plant

	Capital Cost	Annual Cost
Excavation and Unwatering	$15,150 00	....
Masonry	17,660 00	$ 88 00
Hydraulic Installation	15,150 00	757 00
Electrical Installation	15,500 00	855 00
Power-house Accessories	2,500 00	200 00
Timber and Regulating Mechanism	3,350 00	268 00
	$69,310 00	$2,168 00
Engineering and Contingencies, 10%	6,931 00	217 00
Interest during construction, 3%	2,079 00	65 00
Interest, 4½% on $78,320	....	3,528 00
Sinking Fund, 1.8% on $78,320	....	1,411 00
Operation and Administration	....	3,000 00
Power Rental	....	500 00
	$78,320 00	$10,889 00

Cap. cost of 1 h.p. generated, $78.32.
Annual cost of 1 h.p. generated, $10.89.

Estimated Cost of Transmission and Transformation

	Capital Cost	Annual Cost
Step-up Transformation	$ 8,000 00	$ 480 00
Transmission Line	86,000 00	4,750 00
Step-down Transformation	15,000 00	655 00
	$109,000 00	$5,885 00
Engineering and Contingencies, 10%	10,900 00	589 00
Interest during construction, 3%	3,270 00	177 00
Interest, 4½% on $123,170	....	5,543 00
Sinking Fund, 1.8% on $123,170	....	2,217 00
Operation and Administration	....	2,000 00
Patrol	....	500 00
	$123,170 00	$16,911 00

Cap. cost of 1 h.p. transmitted, $123.17.
Annual cost of 1 h.p. transmitted, $16.91.

Summary

	Capital Cost	Annual Cost
Cost of Generation	$78,320 00	$10,889 00
Cost of Transmission and Transformation	123,170 00	16,911 00
Total	$201,490 00	$27,800 00

Capital Cost per h.p. of 1000 h.p. continuous 24 hour power delivered Fort Frances ready for 2200 volt distribution, $201.49.

Annual Cost as above for 1000 h.p., $27.80.

Annual Cost as above based on sale of a connected load of 1300 h.p., $21.40.

Toronto, January 31, 1913.

GRAND RIVER IMPROVEMENT

Preliminary Study dealing with the Possibility of Improving the General Regimen and Local Flow Characteristics of the Grand River by means of Storage and Training Works

Through the progressive obliteration of physical influences governing natural control, the flood flow of the Grand River has for some years past been gradually increasing in volume and destructiveness.

Consequent upon this steady increase in flood discharge, the low-water flow has been as steadily decreasing, so that in addition to a large annual loss by flood damage, there has been a material loss through shrinkage in power capacity. The realization that these conditions would tend to become worse year by year, led a number of the interested Municipalities to solicit the help of the Provincial Government in the matter of an investigation for the purpose of devising, if possible, a feasible remedy; such remedy to serve the joint purpose of ameliorating flood conditions and of increasing the power capacity of the stream under conditions of minimum flow.

During the fall of 1912 a reconnaissance survey was made of the Grand River watershed covering the main stream from Caledonia to headwaters; also of the larger tributaries, including Whiteman's Creek, and the Nith, Speed and Conestogo Rivers from their confluence with the main stream to headwaters.

The main purpose of this reconnaissance was not to furnish definite data as to the possibility or method of flood control, but rather to eliminate from the problem all portions of the watershed possessing physical characteristics of such a nature as to make more detailed examination plainly unnecessary. With the scope of the investigation thus restricted, it remained to ascertain what locations, if any, merited examination as sites for storage reservoirs and regulating works. The following locations, having the desired characteristics in varying degree, were established:

1. A site between Paris and Glenmorris, where by means of a 40 foot dam a storage area of about 1,000 acres would be created. There is also in this vicinity a possibility of controlling about 1,400 acres of storage by means of a 70 foot dam. In both instances the back-water damage would be large, and in the case of the 70 foot dam, would involve the drowning out of several buildings and a considerable length of highway.

2. A site near the village of Blair, where a 30 foot dam would create a storage area about 1,400 acres in extent. The flooded area in this case would be largely meadow land.

3. A site near the town of Elora, where a 30 foot dam would create a storage area about 3,000 acres in extent, the back-water damage involving principally meadow land and river flats.

4. Two sites on the Conestogo River, one of which would have a storage area of about 1,200 acres with a 40 foot dam, and the other about 1,000 acres with a 30 foot dam. In the first case, the back-water damage would involve cultivated land and a number of buildings. In the second case, pasture land would be mainly involved.

5. Two sites on the Speed River, one of which would have a storage area of about 600 acres with a 30 foot dam, and the other about 800 acres with a 35 foot dam. The flooded land is both cases would be swamp and poor meadow land.

6. A site on the Nith River near Canning, where a 65 foot dam would control about 1,100 acres of storage. The back-water damage would be heavy, as a number of buildings would be involved.

7. A site on Whiteman's Creek near Mount Vernon, where a 45 foot dam would control about 450 acres of storage. The topography of the dam-site in this case would allow the construction of a 60 foot dam, but the back-water damage would be very largely increased.

While it is to be understood that the above figures are superficial approximations only, it seems reasonably certain that a system of storage basins as above described would have an aggregate inpounding capacity of not less than five billion cubic feet, in which event some beneficial effect through flood control might be expected.

While the information now available seems to indicate that material benefit may be derived from the construction of storage works, the extent of this benefit and the construction cost cannot be even approximately estimated without the help of instrumental surveys and comprehensive hydrographic study.

For the past eight months gauging stations have been maintained on the Grand River, at Brantford, Glenmorris, Blair and Elora. These stations have been so located as to provide information in connection with the characteristics of the main tributaries, and discharge measurements have been made periodically at each station. These measurements, besides recording the flow characteristics of the river under natural conditions and at different seasons, will provide the necessary data for forecasting the behavior of the river under future conditions of regulated flow.

The surveys necessary will involve,—

1. Instrumental determination of channel slope.

2. Detailed instrumental surveys of sites for proposed dams.

3. Surveys of storage basins to establish flood contours, and to determine the maximum possible or permissible limit of back-water.

The data derived from these surveys will provide the necessary information as to the two governing factors of artificial regulation; namely, the obtainable volume of storage capacity, and the extent of back-water damage. If this information proves that material benefit may be derived from the construction of storage works, the next step will be the exploration of foundation material by means of borings and test-pits, after which detailed construction plans will be prepared with estimates of cost.

It may be here mentioned that throughout the Grand River watershed, with the possible exception of that of the Speed River, the topographical features are unfavorable as affecting the height and length of the necessary dams, and the geological features are unfavorable as affecting their foundations. It is, therefore, certain that the creation of storage reservoirs of adequate capacity will entail a large capital expenditure. This expenditure will also be unfavorably influenced by the necessity of providing large spillway and sluice capacity for the safe passage of flood discharge.

Apart from conservation, another important element of flood control is the handling of back-water and the prevention of riparian damage due to erosion. The proper study of the problem under consideration will, therefore, necessitate the examination and survey of restricted channel sections, and of localities favorable to the formation of ice-jams; also a study of back-water effect due to existing dams.

With this information available it will be possible to determine to what extent, if any, flood damage can be reduced by means of channel improvement and the construction of training works.

The final phase of the investigation will be a careful examination of the more remote portions of the watershed to ascertain whether natural run-off conditions will be materially influenced by the permanent retention of existing swamp area, and furthermore, if any benefit might be gained by allowing areas now drained and reclaimed to lapse into their natural state.

In view of the important interests involved, and the practical certainty of a continuous annual increase in the extent of flood damage in the Grand River Valley, there can be no question as to the necessity of an investigation to determine the means by which this abnormal condition can be remedied or ameliorated.

As the solution of this problem will depend primarily upon data collected in the field, and as the investigation so far made seems to indicate that appreciable benefit is to be derived from the works projected, it is recommended that surveys be carried out along the lines above described, and with the least possible delay.

In conclusion, it is important to note that any experience obtained, or evidence of benefit derived from the carrying out of a flood control scheme on the Grand River, could be advantageously applied to several other streams in the South-western Peninsula which suffer from lack of natural control. Among the most important of these streams are the Thames, the Maitland and the Saugeen.

Toronto, March 31st, 1913.

Daily Gauge Height and Discharge of Grand River, near York, for 1913

Drainage area, 2,311 square miles

Day	January Gauge Ht.	January Dis-charge	February Gauge Ht.	February Dis-charge	March Gauge Ht.	March Dis-charge	April Gauge Ht.	April Dis-charge	May Gauge Ht.	May Dis-charge	June Gauge Ht.	June Dis-charge	July Gauge Ht.	July Dis-charge	August Gauge Ht.	August Dis-charge	September Gauge Ht.	September Dis-charge	October Gauge Ht.	October Dis-charge	November Gauge Ht.	November Dis-charge	December Gauge Ht.	December Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1	....	....	....	....	....	....	....	....	....	....	....	....	593.90	500	593.50	275	593.71	370	593.73	385	....	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	593.94	570	593.54	250	593.73	385	593.75	400	....	....	....	....
3	....	....	....	....	....	....	....	....	....	....	....	....	593.92	530	593.42	188	593.71	370	593.73	385	....	....	....	....
4	....	....	....	....	....	....	....	....	....	....	....	....	593.90	500	593.46	205	593.67	350	593.52	235	....	....	....	....
5	....	....	....	....	....	....	....	....	....	....	....	....	593.90	500	593.46	205	593.91	295	593.50	225	....	....	....	....
6	....	....	....	....	....	....	....	....	....	....	....	....	594.00	600	593.48	210	593.65	338	593.46	205	....	....	....	....
7	....	....	....	....	....	....	....	....	....	....	....	....	594.14	709	593.50	225	593.62	300	593.44	190	....	....	....	....
8	....	....	....	....	....	....	....	....	....	....	....	....	594.04	635	593.50	225	593.65	338	593.58	275	....	....	....	....
9	....	....	....	....	....	....	....	....	....	....	....	....	594.02	610	593.50	225	593.64	329	593.60	285	....	....	....	....
10	....	....	....	....	....	....	....	....	....	....	....	....	593.98	570	593.44	215	593.61	291	543.65	338	....	....	....	....
11	....	....	....	....	....	....	....	....	....	....	....	....	593.98	570	593.56	265	593.61	291	593.63	315	....	....	....	....
12	....	....	....	....	....	....	....	....	....	....	....	....	593.94	555	594.00	600	593.56	260	593.67	350	....	....	....	....
13	....	....	....	....	....	....	....	....	....	....	....	....	593.96	560	594 06	650	593.58	275	593.65	338	....	....	....	....
14	....	....	....	....	....	....	....	....	....	....	....	....	593.94	550	593.98	585	593.58	275	593.76	410	....	....	....	....
15	....	....	....	....	....	....	....	....	....	....	....	....	593.96	560	593.94	565	593.56	260	593.64	320	....	....	....	....
16	....	....	....	....	....	....	....	....	....	....	....	....	593.96	560	593.90	500	593.56	260	593.58	275	....	....	....	....
17	....	....	....	....	....	....	....	....	....	....	....	....	593.96	560	593.67	350	593.48	215	593.58	275	....	....	....	....
18	....	....	....	....	....	....	....	....	....	....	....	....	593.88	490	593.71	370	593.50	225	593.60	285	....	....	....	....
19	....	....	....	....	....	....	....	....	....	....	....	....	593.84	465	593.97	565	593.52	240	593.44	215	....	....	....	....
20	....	....	....	....	....	....	....	....	....	....	....	....	593.71	370	593.71	370	593.52	240	593.62	300	....	....	....	....
21	....	....	....	....	....	....	....	....	....	....	....	....	593.81	440	593.59	275	593.58	275	593.75	400	....	....	....	....
22	....	....	....	....	....	....	....	....	....	....	....	....	593.77	425	593.67	350	593.71	370	593.79	430	....	....	....	....
23	....	....	....	....	....	....	....	....	....	....	....	....	593.75	400	593.75	400	593.71	375	593.83	465	....	....	....	....
24	....	....	....	....	....	....	....	....	....	....	....	....	593.71	370	593.61	295	593.73	385	593.88	500	....	....	....	....
25	....	....	....	....	....	....	....	....	....	....	....	....	593.69	355	593.69	360	593.73	385	394.04	630	....	....	....	....
26	....	....	....	....	....	....	....	....	....	....	....	....	593.69	365	593.73	385	593.79	430	594.19	790	....	....	....	....
27	....	....	....	....	....	....	....	....	....	....	....	....	593.65	338	593.71	370	593.82	455	594.27	860	....	....	....	....
28	....	....	....	....	....	....	....	....	....	....	....	....	593.65	338	593.67	350	593.79	430	594.19	790	....	....	....	....
29	....	....	....	....	....	....	....	....	....	....	....	....	593.59	275	593.65	338	593.75	400	594.12	705	....	....	....	....
30	....	....	....	....	....	....	....	....	....	....	....	....	593.54	240	593.62	300	593.77	415	594.12	705	....	....	....	....
31	....	....	....	....	....	....	....	....	....	....	....	....	593.59	275	593.73	285	....	....	594.12	705	....	....	....	....

Daily Gauge Height and Discharge of Grand River, at Glen Morris, for 1913

Drainage area, 1,385 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.32	230	802.25	160	......	......	......	......
2	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.28	190	802.30	220	......	......	......	......
3	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.28	190	802.28	190	......	......	......	......
4	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.28	190	802.24	150	......	......	......	......
5	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.26	170	802.28	190	802.20	100	......	......	......	......
6	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.22	130	802.28	190	802.28	190	......	......	......	......
7	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.22	130	802.28	190	802.30	220	......	......	......	......
8	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.20	100	802.28	190	802.33	240	......	......	......	......
9	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.24	150	802.27	180	802.32	230	......	......	......	......
10	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.49	430	802.26	170	802.30	220	......	......	......	......
11	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.61	575	802.28	190	Gauge destroyed by school children. Elevation varied very little.	......	......	......	......	......
12	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.45	380	802.28	190		......	......	......	......	......
13	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.45	380	802.25	160		......	......	......	......	......
14	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.45	380	802.23	135		......	......	......	......	......
15	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.36	280	802.24	150		218	......	......	......	......
16	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.24	150		......	......	......	......	......
17	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.26	170		......	......	......	......	......
18	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.29	210		......	......	......	......	......
19	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.26	170		......	......	......	......	......
20	......	......	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.28	190		......	......	......	......	......
21	......	......	......	......	......	......	......	......	......	......	......	......	802.36	280	802.24	150	802.28	190		......	......	......	......	......
22	......	......	......	......	......	......	......	......	......	......	......	......	802.36	280	802.36	280	802.32	230	802.31	225	......	......	......	......
23	......	......	......	......	......	......	......	......	......	......	......	......	802.34	250	802.36	280	802.32	230	802.39	310	......	......	......	......
24	......	......	......	......	......	......	......	......	......	......	......	......	802.32	230	802.36	280	802.34	250	802.50	440	......	......	......	......
25	......	......	......	......	......	......	......	......	......	......	......	......	802.32	230	802.36	280	802.33	240	802.50	440	......	......	......	......
26	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.36	280	802.30	220	802.58	540	......	......	......	......
27	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.36	280	802.30	220	802.50	440	......	......	......	......
28	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.36	280	802.20	100	802.53	470	......	......	......	......
29	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.36	280	802.28	190	802.50	440	......	......	......	......
30	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.36	280	802.28	190	802.50	440	......	......	......	......
31	......	......	......	......	......	......	......	......	......	......	......	......	802.28	190	802.34	250	......	......	802.48	420	......	......	......	......

Daily Gauge Height and Discharge of Grand River, at Galt (Concession St. Bridge), for 1913

Drainage area, 1,356 square miles

Day	January Gauge Ht.	January Discharge	February Gauge Ht.	February Discharge	March Gauge Ht.	March Discharge	April Gauge Ht.	April Discharge	May Gauge Ht.	May Discharge	June Gauge Ht.	June Discharge	July Gauge Ht.	July Discharge	August Gauge Ht.	August Discharge	September Gauge Ht.	September Discharge	October Gauge Ht.	October Discharge	November Gauge Ht.	November Discharge	December Gauge Ht.	December Discharge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1															851.68	108	851.73	123	851.85	160				
2															851.65	100	851.77	135	851.93	190				
3															851.63	90	851.77	135	851.95	200				
4															851.71	118	851.77	135	851.81	148				
5															851.65	199	851.75	130	851.64	95				
6															851.65	100	851.71	118	851.04	230				
7															851.64	95	851.73	123	851.95	200				
8															851.71	118	851.71	118	851.97	210				
9															851.79	140	851.69	112	852.00	220				
10															852.26	318	851.67	107	851.93	190				
11															852.33	340	851.64	95	851.87	170				
12															852.08	240	851.65	100	851.64	95				
13															852.04	230	851.60	80	852.02	228				
14															852.00	220	851.62	90	851.98	215				
15															851.89	175	851.64	95	852.02	228				
16															851.88	170	851.64	95	851.95	200				
17															851.75	130	851.73	123	852.02	228				
18															851.75	130	851.79	140	851.99	215				
19															851.73	123	851.85	160	851.91	185				
20															851.64	95	851.83	150	851.87	170				
21													851.89	172	851.69	110	851.81	148	852.18	280				
22													851.91	185	851.87	170	851.85	160	852.23	305				
23													851.85	160	851.85	160	851.91	185	852.27	318				
24													851.77	135	851.87	170	851.83	150	852.45	390				
25													851.81	148	851.83	150	851.73	123	852.46	395				
26													851.77	135	851.76	135	851.91	185	852.38	360				
27													851.75	130	851.83	150	851.69	112	852.33	340				
28													851.81	148	851.87	170	851.60	80	852.29	325				
29													851.79	140	851.79	140	851.83	150	852.33	340				
30													851.76	135	851.81	148	851.98	215	852.33	340				
31													851.71	118	851.79	140			852.39	365				

Daily Gauge Height and Discharge of Grand River, at Conestogo, for 1913

Drainage area, 538 square miles

Day	January Gauge Ht.	January Dis-charge	February Gauge Ht.	February Dis-charge	March Gauge Ht.	March Dis-charge	April Gauge Ht.	April Dis-charge	May Gauge Ht.	May Dis-charge	June Gauge Ht.	June Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												

Day	July Gauge Ht.	July Dis-charge	August Gauge Ht.	August Dis-charge	September Gauge Ht.	September Dis-charge	October Gauge Ht.	October Dis-charge	November Gauge Ht.	November Dis-charge	December Gauge Ht.	December Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft
1			1017.77	22	1017.97	43	1017.75	21				
2			1017.77	22	1017.77	22	1017.81	26				
3			1017.56	10	1017.66	16	1017.67	16				
4			1017.55	10	1017.68	17	1017.69	17				
5			1017.62	13	1017.80	25	1017.66	16				
6			1017.66	16	1017.83	28	1017.70	18				
7			1017.75	21	1017.60	12	1017.68	17				
8			1017.75	21	1017.75	21	1017.75	21				
9			1017.89	34	1017.66	16	1017.72	20				
10			1018.66	61	1017.66	16	1017.75	21				
11			1018.12	78	1017.64	14	1017.85	30				
12			1018.10	72	1017.78	23	1017.72	19				
13			1018.14	82	1017.86	31	1017.84	29				
14			1017.77	22	1017.61	12	1017.72	20				
15			1017.73	17	1017.63	14	1017.87	31				
16	1018.10	72	1017.80	25	1017.62	13	1017.86	31				
17	1018.10	72	1017.66	16	1017.64	14	1017.87	31				
18	1017.85	30	1017.63	14	1017.66	16	1017.93	40				
19	1017.82	27	1017.64	14	1017.73	20	1017.93	40				
20	1017.66	16	1017.73	17	1017.79	24	1017.91	37				
21	1017.77	22	1017.60	12	1017.72	19	1018.10	72				
22	1017.72	19	1017.85	30	1017.70	18	1018.12	75				
23	1017.82	27	1017.94	40	1017.73	20	1018.11	74				
24	1017.83	28	1017.77	22	1017.83	28	1018.27	121				
25	1017.77	22	1017.81	26	1017.73	20	1018.22	106				
26	1017.79	24	1017.80	25	1017.88	32	1017.99	48				
27	1017.64	14	1017.79	24	1017.83	28	1018.12	75				
28	1017.65	15	1017.77	22	1017.68	17	1018.20	100				
29	1017.70	18	1017.95	42	1017.87	31	1018.13	75				
30	1017.68	17	1017.73	17	1017.79	24	1018.23	109				
31	1017.80	25	1017.57	11			1018.10	72				

Daily Gauge Height and Discharge of Grand River, at Belwood, for 1913

Drainage area, 270 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge	Gauge Ht.	Discharge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.79	4	1366.83	5	1366.83	5	......	.....	......	.....
2	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.77	3	1366.83	5	1366.83	5	......	.....	......	.....
3	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.75	3	1366.83	5	1366.83	5	......	.....	......	.....
4	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.75	3	1366.83	5	1366.83	5	......	.....	......	.....
5	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.75	3	1366.83	5	1366.83	5	......	.....	......	.....
6	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.77	3	1366.83	5	1366.83	5	......	.....	......	.....
7	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.79	4	1366.79	4	1366.83	5	......	.....	......	.....
8	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.79	4	1366.79	4	1366.83	5	......	.....	......	.....
9	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.89	7	1366.79	4	1366.83	5	......	.....	......	.....
10	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.96	9	1366.79	4	1366.83	5	......	.....	......	.....
11	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.90	7	1366.79	4	1366.85	5	......	.....	......	.....
12	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.88	6	1366.81	4	1366.92	7	......	.....	......	.....
13	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.85	5	1366.79	4	1366.92	7	......	.....	......	.....
14	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.83	5	1366.79	4	1366.92	7	......	.....	......	.....
15	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.81	4	1366.79	4	1366.88	6	......	.....	......	.....
16	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.79	4	1366.79	4	1366.88	6	......	.....	......	.....
17	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.79	4	1366.85	5	1366.88	6	......	.....	......	.....
18	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.77	3	1366.90	7	1366.92	7	......	.....	......	.....
19	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.75	3	1366.88	6	1367.00	11	......	.....	......	.....
20	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.75	3	1366.87	5	1367.00	11	......	.....	......	.....
21	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.92	7	1366.90	7	1367.00	11	......	.....	......	.....
22	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.96	9	1366.85	5	1367.00	11	......	.....	......	.....
23	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.94	9	1366.83	5	1367.10	18	......	.....	......	.....
24	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.88	6	1366.85	5	1367.19	31	......	.....	......	.....
25	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.83	5	1366.88	6	1367.13	21	......	.....	......	.....
26	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.83	5	1366.88	6	1367.04	13	......	.....	......	.....
27	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.83	5	1366.85	5	1367.04	13	......	.....	......	.....
28	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.83	5	1366.83	5	1367.05	13	......	.....	......	.....
29	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.85	5	1366.85	5	1367.08	16	......	.....	......	.....
30	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.88	6	1366.88	6	1367.06	14	......	.....	......	.....
31	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1366.88	6	......	.....	1367.00	11	......	.....	......	.....

Daily Gauge Height and Discharge of Nith River, near Canning, for 1913

Drainage area, 386 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	800.88	105	800.78	88	801.11	148	....	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	800.86	102	800.90	110	800.99	122	....	....	....	....
3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	800.76	86	801.07	139	801.07	139	....	....	....	....
4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	800.67	73	801.15	155	801.20	165	....	....	....	....
5	....	....	....	....	....	....	....	....	....	....	....	....	801.17	162	800.96	122	800.11	147	800.90	110	....	....	....	....
6	....	....	....	....	....	....	....	....	....	....	....	....	801.46	225	801.05	134	801.07	139	800.63	74	....	....	....	....
7	....	....	....	....	....	....	....	....	....	....	....	....	801.26	183	801.01	125	800.84	98	801.01	126	....	....	....	....
8	....	....	....	....	....	....	....	....	....	....	....	....	801.38	200	801.07	139	801.01	125	801.11	148	....	....	....	....
9	....	....	....	....	....	....	....	....	....	....	....	....	801.30	190	801.07	139	801.34	193	801.03	128	....	....	....	....
10	....	....	....	....	....	....	....	....	....	....	....	....	801.13	148	801.76	292	801.11	137	800.88	106	....	....	....	....
11	....	....	....	....	....	....	....	....	....	....	....	....	801.30	190	801.46	226	800.82	93	800.82	93	....	....	....	....
12	....	....	....	....	....	....	....	....	....	....	....	....	801.17	161	801.09	143	801.03	130	800.94	116	....	....	....	....
13	....	....	....	....	....	....	....	....	....	....	....	....	801.21	170	801.38	204	800.82	93	800.84	98	....	....	....	....
14	....	....	....	....	....	....	....	....	....	....	....	....	800.96	122	801.13	148	800.92	113	801.09	142	....	....	....	....
15	....	....	....	....	....	....	....	....	....	....	....	....	801.13	148	801.29	188	800.69	75	801.03	128	....	....	....	....
16	....	....	....	....	....	....	....	....	....	....	....	....	801.05	134	801.30	190	801.05	134	800.89	108	....	....	....	....
17	....	....	....	....	....	....	....	....	....	....	....	....	801.07	139	801.19	160	801.09	142	801.21	168	....	....	....	....
18	....	....	....	....	....	....	....	....	....	....	....	....	801.07	139	801.13	148	800.86	102	801.10	145	....	....	....	....
19	....	....	....	....	....	....	....	....	....	....	....	....	801.11	147	801.05	134	800.99	122	800.98	123	....	....	....	....
20	....	....	....	....	....	....	....	....	....	....	....	....	800.30	40	800.90	110	800.72	79	801.00	124	....	....	....	....
21	....	....	....	....	....	....	....	....	....	....	....	....	800 60	70	800.94	118	800.92	113	801.25	185	....	....	....	....
22	....	....	....	....	....	....	....	....	....	....	....	....	800.96	122	800.92	114	801.01	125	801.23	170	....	....	....	....
23	....	....	....	....	....	....	....	....	....	....	....	....	801.05	134	801.11	148	801.28	185	801.27	188	....	....	....	....
24	....	....	....	....	....	....	....	....	....	....	....	....	800.96	122	801.09	143	801.05	134	801.37	208	....	....	....	....
25	....	....	....	....	....	....	....	....	....	....	....	....	801.01	130	800.78	88	800.97	126	801.39	210	....	....	....	....
26	....	....	....	....	....	....	....	....	....	....	....	....	800.88	105	600.82	93	801.05	134	801.29	188	....	....	....	....
27	....	....	....	....	....	....	....	....	....	....	....	....	800.92	113	801.01	125	801.13	148	801.35	204	....	....	....	....
28	....	....	....	....	....	....	....	....	....	....	....	....	801.09	143	801.19	162	800.92	113	801.25	180	....	....	....	....
29	....	....	....	....	....	....	....	....	....	....	....	....	800.94	116	800.99	122	800.80	90	801.33	198	....	....	....	....
30	....	....	....	....	....	....	....	....	....	....	....	....	800.88	105	801.07	139	801.09	142	801.31	192	....	....	....	....
31	....	....	....	....	....	....	....	....	....	....	....	....	800.94	116	800.97	120	....	....	801.35	204	....	....	....	....

Daily Gauge Height and Discharge of Speed and Eramosa Rivers, at Gordon St. Bridge, Guelph, for 1913

Drainage area, 193 square miles

Day	January Gauge Ht.	January Dis-charge	February Gauge Ht.	February Dis-charge	March Gauge Ht.	March Dis-charge	April Gauge Ht.	April Dis-charge	May Gauge Ht.	May Dis-charge	June Gauge Ht.	June Dis-charge	July Gauge Ht.	July Dis-charge	August Gauge Ht.	August Dis-charge	September Gauge Ht.	September Dis-charge	October Gauge Ht.	October Dis-charge	November Gauge Ht.	November Dis-charge	December Gauge Ht.	December Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.78	6	1006.01	14	1006.13	20	....	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.88	9	1006.05	16	1006.05	16	....	....	....	....
3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.72	5	1005.88	9	1006.05	16	....	....	....	....
4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.76	6	1005.97	13	1006.01	14	....	....	....	....
5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.76	6	1006.05	16	1006.01	14	....	....	....	....
6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.76	6	1006.09	18	1006.05	16	....	....	....	....
7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.76	6	1005.97	13	1006.13	20	....	....	....	....
8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.84	7	1005.92	11	1006.09	18	....	....	....	....
9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.05	16	1005.92	11	1006.13	20	....	....	....	....
10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.17	23	1005.97	13	1006.09	18	....	....	....	....
11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.26	29	1005.88	9	1006.01	14	....	....	....	....
12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.26	29	1005.97	13	1005.97	13	....	....	....	....
13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.26	29	1006.01	14	1006.01	14	....	....	....	....
14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.26	29	1005.88	9	1006.13	20	....	....	....	....
15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.05	16	1005.72	5	1006.22	26	....	....	....	....
16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.01	14	1005.76	6	1006.22	26	....	....	....	....
17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.92	11	1005.84	7	1006.17	23	....	....	....	....
18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.92	11	1006.13	20	1006.22	26	....	....	....	....
19	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.84	7	1006.01	14	1006.13	20	....	....	....	....
20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.72	5	1006.13	20	1006.26	29	....	....	....	....
21	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.82	7	1006.17	23	1006.51	48	....	....	....	....
22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.84	7	1006.09	18	1006.34	34	....	....	....	....
23	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.88	9	1006.26	29	1006.30	32	....	....	....	....
24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1005.97	13	1006.22	26	1006.39	37	....	....	....	....
25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.05	16	1006.09	18	1006.60	58	....	....	....	....
26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.09	18	1006.09	18	1006.29	31	....	....	....	....
27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.26	29	1006.01	14	1006.35	35	....	....	....	....
28	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1006.22	26	1006.09	18	1006.33	33	....	....	....	....
29	....	....	....	....	....	....	....	....	....	....	....	....	1003.97	13	1006.17	23	1006.09	18	1006.31	32	....	....	....	....
30	....	....	....	....	....	....	....	....	....	....	....	....	1005.71	5	1006.13	20	1006.09	18	1006.29	31	....	....	....	....
31	....	....	....	....	....	....	....	....	....	....	....	....	1005.72	5	1005.88	9	....	....	1006.31	32	....	....	....	....

Daily Gauge Height and Discharge of Speed River, near Guelph (Leslie's Bridge), for 1913

Drainage area, 63 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.17	7	1108.15	7	1108.27	10	......	.....	......	.....
2	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.08	5	1108.22	8	1108.12	6	......	.....	......	.....
3	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.02	4	1108.15	7	1108.14	7	......	.....	......	.....
4	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.06	4	1108.30	11	1108.21	8	......	.....	......	.....
5	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.07	5	1108.19	8	1108.33	12	......	.....	......	.....
6	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.06	4	1108.25	9	1108.14	7	......	.....	......	.....
7	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.08	5	1108.17	7	1108.20	8	......	.....	......	.....
8	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.17	7	1108.21	8	1108.24	9	......	.....	......	.....
9	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.17	7	1108.12	6	1108.24	9	......	.....	......	.....
10	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.20	8	1108.24	9	1108.23	9	......	.....	......	.....
11	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.22	8	1108.17	7	1108.19	8	......	.....	......	.....
12	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.17	7	1108.23	9	1108.26	9	......	.....	......	.....
13	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.17	7	1108.14	7	1108.28	10	......	.....	......	.....
14	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.18	7	1108.05	4	1108.27	9	......	.....	......	.....
15	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.14	7	1108.14	7	1108.22	8	......	.....	......	.....
16	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.13	7	1108.17	7	1108.26	9	......	.....	......	.....
17	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.14	7	1108.26	9	1108.31	11	......	.....	......	.....
18	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.13	7	1108.14	7	1108.32	11	......	.....	......	.....
19	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.18	8	1108.37	13	1108.26	9	......	.....	......	.....
20	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.15	7	1108.14	7	1108.26	9	......	.....	......	.....
21	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.15	7	1108.14	7	1108.31	11	......	.....	......	.....
22	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.31	11	1108.39	15	1108.39	15	......	.....	......	.....
23	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.17	7	1108.34	12	1108.37	13	......	.....	......	.....
24	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.24	9	1108.17	7	1108.47	21	......	.....	......	.....
25	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.28	10	1108.17	7	1108.46	20	......	.....	......	.....
26	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.18	7	1108.34	12	1108.49	23	......	.....	......	.....
27	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.07	4	1108.12	6	1108.48	23	......	.....	......	.....
28	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.28	10	1108.18	8	1108.09	6	1108.49	23	......	.....	......	.....
29	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.11	6	1108.15	7	1108.13	7	1108.50	24	......	.....	......	.....
30	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1108.24	9	1108.28	10	1108.17	7	1108.54	27	......	.....	......	.....
31	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	1103.15	7	1108.30	11	......	.....	1108.44	19	......	.....	......	.....

Daily Gauge Height and Discharge of Conestogo River, at St. Jacob for 1913

Drainage area, 312 square miles

Day	January Gauge Ht.	January Discharge	February Gauge Ht.	February Discharge	March Gauge Ht.	March Discharge	April Gauge Ht.	April Discharge	May Gauge Ht.	May Discharge	June Gauge Ht.	June Discharge	July Gauge Ht.	July Discharge	August Gauge Ht.	August Discharge	September Gauge Ht.	September Discharge	October Gauge Ht.	October Discharge	November Gauge Ht.	November Discharge	December Gauge Ht.	December Discharge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1058.00	9	1058 00	9	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1058.04	12	1058.00	9	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1058.04	12	1058.00	9	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1058.04	12	1058.04	12	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1057.95	8	1057.95	7	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1057.95	8	1057.93	6	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1057.91	6	1057.95	7	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1057.91	6	1057.95	7	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.08	15	1057.95	7	1057.95	7	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.12	18	1057.95	7	1057.95	7	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.08	15	1057.95	7	1057.97	8	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.08	15	1057.95	7	1057.94	6	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1057.91	6	1058.04	12	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1057.91	6	1057.97	8	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1057.91	6	1058.08	15	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	1058.32	37	1058.00	9	1057.91	6	1058.06	14	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	1058.24	30	1058.00	9	1058.00	9	1057.97	8	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	1058.16	21	1058.00	9	1057.95	7	1057.95	7	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1058.00	9	1057.95	7	1057.95	7	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1058.00	9	1057.95	7	1058.12	18	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1057.95	7	1058.00	9	1058.16	21	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1057.97	8	1058.00	9	1058.04	12	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	1058.04	12	1058.00	9	1057.96	8	1058.08	15	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1058.00	9	1057.93	6	1058.16	21	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	1058.00	9	1058.00	9	1057.95	7	1058.10	17	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1058.04	12	1057.95	7	1058.12	18	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1058.01	10	1058.04	12	1058.33	40	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	1057.91	6	1058.04	12	1058.05	13	1058.25	30	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1058.00	9	1058.04	12	1058.46	63	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1058.00	9	1058.00	9	1058.62	99	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	1057.95	7	1058.00	9	...	...	1058.81	158	...	...	...	...

Daily Gauge Height and Discharge of Fairchild's Creek, near Onondaga, for 1913

Drainage area, 112 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.02	13	622.04	15	622.04	15	......	.....	......	.....
2	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.04	15	622.04	15	622.04	15	......	.....	......	.....
3	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.04	15	622.04	15	622.05	15	622.06	15	......	.....	......	.....
4	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.06	15	622.04	15	622.06	15	622.04	15	......	.....	......	.....
5	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.14	21	622.06	15	622.04	15	622.00	13	......	.....	......	.....
6	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.29	36	622.06	15	622.04	15	622.00	13	......	.....	......	.....
7	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.14	20	622.04	15	622.04	15	622.04	15	......	.....	......	.....
8	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.12	19	622.04	15	622.00	13	622.02	13	......	.....	......	.....
9	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.07	16	622.00	13	622.04	15	......	.....	......	.....
10	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.10	17	622.24	29	622.00	13	622.06	15	......	.....	......	.....
11	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.22	28	622.54	65	622.00	13	622.04	15	......	.....	......	.....
12	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.10	17	622.31	38	622.00	13	622.04	15	......	.....	......	.....
13	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.24	29	622.20	27	621.97	11	622.06	15	......	.....	......	.....
14	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.20	26	622.14	20	621.97	11	622.04	15	......	.....	......	.....
15	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.12	18	622.08	16	622.00	13	622.06	15	......	.....	......	.....
16	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.04	15	622.02	14	622.04	15	......	.....	......	.....
17	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.04	15	622.04	15	622.04	15	......	.....	......	.....
18	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.10	17	622.06	15	622.08	16	622.06	15	......	.....	......	.....
19	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.12	19	622.04	15	622.08	16	622.08	16	......	.....	......	.....
20	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.04	15	622.06	15	622.08	16	......	.....	......	.....
21	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.04	15	622.12	17	622.08	16	......	.....	......	.....
22	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.12	19	622.06	15	622.20	26	622.08	16	......	.....	......	.....
23	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.20	27	622.10	17	622.04	15	......	.....	......	.....
24	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.22	29	622.08	16	622.10	17	......	.....	......	.....
25	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.12	17	622.04	15	622.16	19	......	.....	......	.....
26	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.04	15	6 2.08	16	622.04	15	622.25	32	......	.....	......	.....
27	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.04	15	622.06	15	622.02	13	622.14	18	......	.....	......	.....
28	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.04	15	622.04	15	622.02	13	622.08	16	......	.....	......	.....
29	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.08	16	622.12	17	622.04	15	622.10	17	......	.....	......	.....
30	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.04	15	622.12	17	623.04	15	622.12	17	......	.....	......	.....
31	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	622.04	15	622.08	16	......	.....	622.12	17	......	.....	......	.....

Daily Gauge Height and Discharge of Boston Creek, near York, for 1913

Drainage area, 123 square miles

Day	January Gauge Ht.	January Discharge	February Gauge Ht.	February Discharge	March Gauge Ht.	March Discharge	April Gauge Ht.	April Discharge	May Gauge Ht.	May Discharge	June Gauge Ht.	June Discharge	July Gauge Ht.	July Discharge	August Gauge Ht.	August Discharge	September Gauge Ht.	September Discharge	October Gauge Ht.	October Discharge	November Gauge Ht.	November Discharge	December Gauge Ht.	December Discharge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	...	...	...	...	...	...	...	...	...	...	...	...	592.13	16	591.92	7	592.02	11	591.96	8	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	592.13	16	591.92	7	592.04	12	591.94	8	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	592.15	16	591.86	6	592.11	15	592.00	10	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	592.23	19	591.86	6	592.08	14	592.02	11	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	592.13	16	591.84	6	592.02	11	591.94	8	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	592.21	18	591.84	6	591.98	9	591.94	8	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	592.25	20	591.88	7	591.98	9	592.00	10	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	592.25	20	591.90	7	591.98	9	591.98	9	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	592.21	18	591.96	8	591.96	8	591.98	9	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	592.27	22	591.94	8	591.98	9	591.94	8	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	592.17	17	592.02	11	592.10	15	591.98	9	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	592.17	17	592.29	25	591.94	8	391.86	5	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	592.17	17	592.21	18	591.94	8	592.02	13	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	592.17	17	592.11	15	591.86	6	591.94	8	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	592.15	16	592.17	17	591.86	6	591.98	9	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	592.15	16	592.02	11	591.82	5	591.98	9	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	592.11	15	592.02	11	591.90	7	591.98	9	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	592.15	16	592.02	11	591.86	6	592.02	11	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	592.09	14	592.02	11	591.86	6	591.92	7	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	592.02	11	592.04	12	591.90	7	592.02	11	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	593.04	12	591.98	9	591.94	8	592.10	15	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	592.06	13	591.98	9	591.98	9	592.10	15	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	592.04	12	591.98	9	592.02	11	592.10	15	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	592.02	11	591.94	8	592.02	11	592.17	17	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	591.98	9	592.02	11	592.00	10	592.27	22	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	591.96	8	592.09	14	592.02	11	592.37	32	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	591.94	8	592.09	14	592.02	11	592.40	35	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	591.98	9	592.02	11	591.94	8	592.33	28	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	591.98	9	592.17	17	591.94	8	592.33	28	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	591.94	8	592.11	15	592.02	11	592.31	26	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	591.92	7	592.04	12	...	...	592.31	26	...	...	...	...

Daily Gauge Height and Discharge of Galt Creek, at Kerr St., Galt, for 1913

Drainage area, 48 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.20	15	893.33	25	893.33	25	....	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.23	17	893.25	20	893.44	36	....	....	....	....
3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.23	17	893.29	23	893.48	39	....	....	....	....
4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.31	25	893.29	23	893.33	25	....	....	....	....
5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.21	16	893.33	25	893.40	32	....	....	....	....
6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.23	17	893.27	23	893.54	44	....	....	....	....
7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.43	33	893.23	17	893.31	25	....	....	....	....
8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.23	17	893.27	23	893.35	27	....	....	....	....
9	....	....	....	....	....	....	....	....	....	....	....	....	893.31	25	893.31	25	893.25	20	893.35	27	....	....	....	....
10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.56	45	893.31	25	893.44	36	....	....	....	....
11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.63	52	893.29	23	893.40	32	....	....	....	....
12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.42	33	893.23	17	893.46	36	....	....	....	....
13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.50	40	893.27	23	893.46	36	....	....	....	....
14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.29	23	893.27	27	893.37	28	....	....	....	....
15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.31	25	893.19	15	893.50	40	....	....	....	....
16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.32	25	893.23	17	893.42	33	....	....	....	....
17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.31	25	893.44	36	893.48	39	....	....	....	....
18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.27	22	863.39	31	893.48	39	....	....	....	....
19	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.23	17	893.35	27	893.49	39	....	....	....	....
20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	893.22	17	893.50	40	893.50	40	....	....	....	....
21	....	....	....	....	....	....	....	....	....	....	....	....	893.29	23	893.46	36	893.54	44	893.50	40	....	....	....	....
22	....	....	....	....	....	....	....	....	....	....	....	....	893.31	25	893.31	25	893.50	40	893.56	46	....	....	....	....
23	....	....	....	....	....	....	....	....	....	....	....	....	893.29	23	893.33	25	893.30	32	893.50	40	....	....	....	....
24	....	....	....	....	....	....	....	....	....	....	....	....	893.28	23	893.40	32	893.46	36	893.56	46	....	....	....	....
25	....	....	....	....	....	....	....	....	....	....	....	....	893.29	23	893.31	25	893.36	27	893.72	59	....	....	....	....
26	....	....	....	....	....	....	....	....	....	....	....	....	893.28	23	893.31	25	893.35	27	893.60	49	....	....	....	....
27	....	....	....	....	....	....	....	....	....	....	....	....	893.27	22	893.27	23	893.37	28	893.56	46	....	....	....	....
28	....	....	....	....	....	....	....	....	....	....	....	....	893.25	20	893.52	41	893.40	32	893.31	25	....	....	....	....
29	....	....	....	....	....	....	....	....	....	....	....	....	893.23	17	893.31	25	893.44	36	893.50	40	....	....	....	....
30	....	....	....	....	....	....	....	....	....	....	....	....	893.21	16	893.33	25	893.35	27	893.47	39	....	....	....	....
31	....	....	....	....	....	....	....	....	....	....	....	....	893.21	16	893.31	25	....	....	893.40	32	....	....	....	....

Daily Gauge Height and Discharge of Whiteman's Creek, near Burford, for 1913

Drainage area, 153 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1													690.82	37										
2																								
3																								
4																								
5																								
6																								
7																								
8																			690.84	37				
9																								
10																								
11																								
12																	690.72	29						
13																								
14															690.94	46								
15																			690.83	36				
16																			690.81	35				
17																			690.85	38				
18																			690.85	38				
19																			690.83	36				
20																			690.88	41				
21																			690.96	48				
22																			690.94	46				
23																			690.94	46				
24																			691.00	53				
25																			691.08	61				
26																			691.00	53				
27																			690.88	41				
28																			691.00	53				
29																			691.04	56				
30																			691.02	54				
31																			691.00	53				

Daily Gauge Height and Discharge of Irvin River, at Salem, for 1913

Drainage area, 64 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.84	1	1262.97	2	1262.92	1	....	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.88	1	1262.97	2	1262.92	1	....	....	....	....
3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.88	1	1262.97	2	1262.92	1	....	....	....	....
4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.90	1	1262.97	2	1262.92	1	....	....	....	....
5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.90	1	1262.97	2	1262.92	1	....	....	....	....
6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.90	1	1262.92	1	1262.92	1	....	....	....	....
7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.90	1	1262.92	1	1262.92	1	....	....	....	....
8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	Gauge affected by backwater, elev. varied but little.		1262.92	1	1262.92	1	....	....	....	....
9	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.90	1	1262.92	1	....	....	....	....
10	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1	1262.92	1	....	....	....	....
11	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1	1262.92	1	....	....	....	....
12	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1	1263.05	2	....	....	....	....
13	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1	Gauge affected by backwater. Now cancelled.		....	....	....	....
14	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1			....	....	....	....
15	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1			....	....	....	....
16	....	....	....	....	....	....	....	....	....	....	....	....	....	....			1262.88	1			....	....	....	....
17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.97	1	1262.88	1			....	....	....	....
18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.90	1			....	....	....	....
19	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.92	1	1262.97	2			....	....	....	....
20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.92	1	1263.17 1262.97	3			....	....	....	....
21	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.92	1	1262.97	2			....	....	....	....
22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.94	1	1262.97	2			....	....	....	....
23	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1263.03	2	1263.05	2	See second gauge for this stream where conditions are normal		....	....	....	....
24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1263.01	2	1263.05	2			....	....	....	....
25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1263.01	2			....	....	....	....
26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1263.17 1262.99	3	1262.99	2			....	....	....	....
27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.97	2	1262.97	2		El. 1263.35 Dis. 6.93	....	....	....	....
28	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.97	2	1262.97	2			....	....	....	....
29	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1262.97	2	1262.92	1			....	....	....	....
30	....	....	....	....	....	....	....	....	....	....	....	....	1262.92	1	1263.01	2	1262.92	1			....	....	....	....
31	....	....	....	....	....	....	....	....	....	....	....	....	1262.88	1	1263.01	2	1262.92	1			....	....	....	....

Monthly discharge of Grand River at York for year 1913

Drainage area, 2,311 square miles.

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth of inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	709	240	477	.31	.10	.21	.24
August	650	183	350	.28	.08	.15	.17
September	455	215	327	.20	.09	.14	.16
October	860	205	419	.37	.09	.18	.21
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	860	188	393	.37	.08	.17	.78

Monthly discharge of Grand River at Glen Morris for year 1913

Drainage area 1,385 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	575	100	249	.42	.07	.18	.21
September	250	100	189	.18	.07	.14	.16
October	540	100	274	.39	.07	.20	.23
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	575	100	237	.42	.07	.17	.60

Monthly Discharge of Grand River at Concession St. Bridge, Galt, for year 1913

Drainage area 1,356 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	340	90	154	.25	.07	.11	.13
September	215	80	129	.16	.06	.10	.11
October	395	95	243	.29	.07	.18	.21
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	395	80	175	.29	.06	.13	.45

Monthly discharge of Grand River at Conestogo for 1913

Drainage area, 538 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
Jannary	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	82	10	28	.15	.02	.05	.06
September	43	12	21	.21	.02	.04	.04
October	121	16	46	.22	.03	.09	.10
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	121	10	32	.22	.02	.06	.20

Monthly discharge of Grand River at Belwood for year 1913

Drainage area, 270 square miles

Month.	Discharge in second-feet.			Discharge in second-feet. per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	9	3	5	.03	.01	.02	.02
September	7	4	5	.03	.01	.02	.02
October	31	5	9	.11	.02	.03	.03
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	31	3	6	.11	.01	.02	.07

Monthly discharge of Nith River at Canning for year 1913

Drainage area, 386 square miles.

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
*July	225	40	145	.58	.10	.38	.44
August	292	73	140	.76	.19	.36	.42
September	193	75	124	.50	.19	.32	.36
October	210	74	150	.54	.19	.39	.45
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	292	40	140	.76	.10	.36	1.67

* Portion of month only.

Monthly discharge of Speed River, Gordon St. Bridge, Guelph, for year 1913

Drainage area, 193 square miles.

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	29	5	14	.15	.03	.07	.08
September	29	5	15	.15	.03	.08	.09
October	58	13	25	.30	.07	.07	.08
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	58	5	18	.30	.03	.09	.25

Monthly discharge of Speed River at Leslie's Bridge, near Guelph, for year 1913

Drainage area 63 square miles.

Month.	Discharge in second-feet			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	11	4	7	.17	.06	.11	.13
September	15	4	8	.24	.06	.13	.14
October	27	6	13	.43	.10	.21	.24
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	27	4	9	.43	.06	.14	.51

Monthly discharge of Conestogo River at St. Jacob for year 1913

Drainage area 312 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Meau.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	....	....	....	....	....	....	....
August	18	6	9	.06	.02	.03	.03
September	13	6	8	.04	.02	.03	.03
October	158	6	22	.50	.02	.07	.08
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	158	6	13	.50	.02	.04	.14

Monthly discharge of Fairchild's Creek near Onondaga for year 1913

Drainage area, 112 square miles

Month	Discharge in second-feet,			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	36	15	18	.32	.13	.16	.18
August	65	13	19	.58	.12	.17	.20
September	26	11	15	.23	.10	.13	.14
October	32	13	16	.29	.12	.14	.16
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	65	11	17	.58	.10	.15	.69

Monthly discharge of Boston Creek at York for year 1913

Drainage area, 123 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Maximum.	Mean.	Depth in inches on drainage area.
January	......	......	......	......	......	......	......
February	......	......	......	......	......	......	......
March	......	......	......	......	......	......	......
April	......	......	......	......	......	......	......
May	......	......	......	......	......	......	......
June	......	......	......	......	......	......	......
July	22	7	14	.18	.06	.11	.13
August	25	6	11	.20	.05	.09	.10
September	15	6	9	.12	.05	.07	.08
October	35	5	14	.28	.04	.11	.13
November	......	......	......	......	......	......	......
December	......	......	......	......	......	......	......
The period	35	5	12	.28	.04	.10	.44

Monthly discharge of Galt Creek at Kerr St. Bridge, Galt, for year 1913

Drainage area, 48 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area
January	......	......	......	......	......	......	......
February	......	......	......	......	......	......	......
March	......	......	......	......	......	......	......
April	......	......	......	......	......	......	......
May	......	......	......	......	......	......	......
June	......	......	......	......	......	......	......
July	......	......	......	......	......	......	......
August	52	15	26	1.08	.31	.54	.62
September	44	15	27	.92	.31	.56	.62
October	59	25	37	1.23	.52	.77	.89
November	......	......	......	......	......	......	......
December	......	......	......	......	......	......	......
The period	59	15	30	1.23	.31	.62	2.13

Bench Marks on Grand River

Location	Elevation above Lake Erie.	Elevation above mean tide, New York.	Mileage.
B.M. on abut. of Dunnville dam	12.53	586.47	0.00
B.M. on top of 2nd Pier, Road Bridge, Cayuga	21.93	595.87	15.
B.M. on top of 1st Pier, Road Bridge, York	34.26	608.20	22.
B.M. on top of 1st Pier, Road Bridge, Caledonia	51.38	625.32	26.
B.M. on footing 2nd Pier, Cockshutt's Bridge at Brantford.	67.32	641.26	53.
B.M. on footing of left abutment, T. H. & B. Ry. Bridge, Brantford	71.53	645.47	57.
B.M. on top of abutment next to head race of Watson's dam, Brantford	106.86	680.80	60.
B.M. on wing wall upstream side left abutment, Dumfries St. Bridge, Paris	160.57	734.51	68.
B.M. on downstream side, 1st Pier, William St. Bridge, Paris	167.25	741.19	69.
B.M. on left abutment on projecting rock in 2nd course of stone work, G.T.R. Bridge, 2½ miles above Paris	180.90	754.84	71.
B.M. on top of middle pier, downstream side, Glen Morris Bridge, Glen Morris	245.67	819.61	....
B.M. on top of left abutment, upstream side, road bridge below Galt	275.81	849.75	89.
B.M. on top of downstream corner girder sill of right abutment, G. P. & H. Ry. bridge, Galt	295.68	869.62	82.
B.M. on concrete under muzzle of old cannon opposite Main St., Galt	303.17	877.11	83.
B.M. on floor of bridge at Blair	335.18	909.12	88.
B.M. on top of left pier, upstream side, County Bridge, Freeport	362.69	936.63	94.
B.M. on nose of left pier, G.T.R. Bridge, Breslau	287.28	961.22	101.
B.M. on top of centre pier, downstream side, road bridge, Bridgeport	417.59	991.53	104.
B.M. on top of wing wall of left abutment, downstream side, Conestogo Bridge	463.18	1,037.12	112.
B.M. on top of centre pier, Winterbourne Bridge	474.11	1,048.05	115.
B.M. on top of beam in right hand shore crib of West Montrose Bridge	479.23	1,053.17	117.
B.M. on ledge on corner of left pier, downstream side, road bridge	526.49	1,100.43	123.
B.M. on top of right abutment, road bridge, Elora	649.03	1,222.97	129.
B.M. on s.w. corner west wall of Bissell's head race, Elora.	656.43	1,230.37	129.
B.M. corner of left abutment flour mill dam, Fergus	725.77	1,299.71	133.
B.M. top of right abutment, downstream side, concession five road bridge, one mile below Belwood	785.57	1,359.51	....
B.M. downstream side, right abutment Belwood Bridge	806.21	1,380.15	....

Bench Marks on Speed River

Location.	Elevation above Lake Erie.	Elevation above mean tide, New York.	Mileage from mouth
B.M. upper left waste gate of dam, Preston	321.69	895.63	1.30
B.M. on right abutment of right hand road bridge above Preston	335.65	909 59	2.43
B.M. on end of downstream wing wall left abutment of left hand bridge below Hespeler	355.11	929.05	3.65
B.M. on bottom of tie in left span G.T.R. Bridge, Hespeler.	375.70	949.64	4.71
B.M. downstream corner right abutment Town road bridge, Hespeler	367.99	941.93	5.00
B.M. on downstream corner left abutment Coles and Sons dam	380.03	953.97	6.78
B.M. on tension rod downstream side road bridge	410.49	984.43	10.56
B.M. on tension rod downstream side road bridge	412.27	986.21	11.72
B.M. right hand downstream corner Gordon St. bridge, Guelph	446.05	1,019.99	15.26
B.M. Corporation of Guelph —			
B.M. No. 72 =	....	1,016.75	....
B.M. No. 63 =	....	1,031.91	....
B.M. No. 81 =	....	1,025.10	....
B.M. on downstream wing wall left abutment road bridge near Simpson's Mill	495.43	1,069.37	17.51
B.M. on upstream side of 1st pier, Leslie's Bridge, above Guelph	544.06	1,118.00	21.81
B.M. on upstream side, sill of right abutment, Caraher's Bridge	560.55	1,134.49	23.65

Bench Marks on Nith River

B.M. on top of 2nd step from bottom of right abutment, Penman's dam, Paris	174.82	748.76	0.75
B.M. on upstream wing wall of left abutment, road bridge at gauging station	245.54	819.48	7.44

DESCRIPTION OF GAUGES ESTABLISHED ON GRAND RIVER AND TRIBUTARIES

Gauge No. 1

On Boston Creek, ¼-mile from the Village of York, on the Concession River Road Bridge, Township of Oneida, County of Haldimand. Zero on gauge 591.00.

Gauge No. 2

On Grand River, East approach of Grand River Bridge, Front Street, Village of York, Township of Seneca, County of Haldimand. Zero on gauge 593.00.

Gauge No. 3

On Fairchild's Creek, 1¾ miles from the Village of Onondaga on the Onondaga Road, 3rd Concession, Township of Onondaga, County of Brant. This bridge is called Howell's Bridge. Zero on gauge 621.00.

Gauge No. 4

On Grand River on the Toronto, Hamilton and Buffalo Railway Bridge, East approach in the City of Brantford, County of Brant. Zero on gauge 643.00.

Gauge No. 5

On the Western Counties Canal on the East side of the new concrete Market Street Bridge, in the City of Brantford, County of Brant. Zero on gauge 650.00.

Gauge No. 6

On Whiteman's Creek on the first bridge above the Junction of the Grand River and Whiteman's Creek, 4¾ miles from the City of Brantford, County of Brant. Zero on gauge 690.00.

Gauge No. 7

On the Grand River on the Dundas Street Bridge in the Town of Paris, County of Brant. Zero on gauge 717.00.

Gauge No. 8

On the Nith River on the 2nd Concession, Lot 2, Township of Blenheim, County of Oxford, 4½ miles from Paris. Zero on gauge 799.00.

Gauge No. 9

On the Grand River on the Glenmorris Bridge in the Village of Glenmorris, 6th Concession, Township of South Dumfries, County of Brant. Zero on gauge 801.00.

Gauge No. 10

On the Grand River on the Concession Street Bridge, in the Town of Galt, County of Waterloo. Zero on gauge 851.00.

Gauge No. 11

On the Galt Creek on the Kerr Street Bridge in the Town of Galt, County of Waterloo. Zero on gauge 893.00.

Gauge No. 12

On the Speed River on the gaol wall adjoining the power house in the Town of Hespeler. Zero on gauge 935.00.

Gauge No. 13

On the Speed and Eramosa Rivers on the Gordon Street Bridge in the City of Guelph. Zero on gauge 1005.00.

Gauge No. 14

On the Grand River on the Grand River Bridge in the Village of Conestogo. Zero on gauge 1017.00.

Gauge No. 15

On the Conestogo River on the St. Jacob's Bridge, in the Village of St. Jacob's, in the Township of Woolwich, County of Waterloo. Zero on gauge 1057.00.

Gauge No. 16

On the Speed River above the Junction of the Speed and Eramosa Rivers on Caraher's Bridge on the Eramosa Road, 3¾ miles from the City of Guelph. Zero on gauge 1126.00.

Gauge No. 17

On the Irvin River on Watt's Bridge on the blind line between the 11th and 12th Concession, Lot 14, Township of Nichol, County of Wellington. Zero on gauge 1297.00.

Gauge No. 18

On the Grand River on the Belwood Bridge in the Village of Belwood on the 7th Concession, Township of Garafraxa, County of Wellington. Zero on gauge 1366.00.

STORAGE POSSIBILITIES OF THE WATERSHED TRIBUTARY TO RAINY LAKE

Manitou Lakes

The drainage area of these lakes is about 446 sq. miles, and the area of the lakes themselves is about 66 sq. miles.

A storage draft of 7 feet off these lakes would provide approximately 13,000 million cubic feet of storage, which would probably be more than sufficient to control the entire mean annual run-off of the tributary watershed.

At present there is a Government dam at the foot of the lower lake that would hold a storage head of 9.9 feet if it were in good condition.

The shores of the lake are for the most part rock with large patches of good jack pine here and there, but this is all well up from the lake. The present dam did practically no damage to timber, and the damage caused by a dam that would raise the water 3 ft. higher than at present would be very small.

The sill of the log chute of the present dam is sufficiently low to let the water run as low as the controlling ledge at Cedar Rapids which is above the dam.

The present dam had the stop-logs in when the dam was inspected, but it was leaking about 150 second feet, partly through and partly underneath.

A cross section parallel and similar to the one taken exists 50 feet below the present dam.

No building sand was observed on this lake.

The buildings around the lake are high enough to permit of a rise of 3 feet above high water mark. These are only log shacks, not used at present.

The present dam is not built on solid rock, but the banks of the river are solid rock with large boulders and gravel bottom in the river bed.

The lumbermen who remembered this dam from its installation had never known the lake to be filled to the top of the dam.

Otukamamawan Lake

The drainage area of the lake above a possible dam site is about 500 sq. miles, and the area of lake surface above this site is about 18 sq. miles.

A dam at this point holding 30 ft. of water on the sills would impound a run-off of 12 inches from the tributary watershed. This figure is probably greater than the actual mean annual run-off.

There is evidence at the outlet of the lake to show that there existed at one time a small dam probably holding a two to three foot head of water, but no impounding action is caused by the fragments which now remain.

A cross-section of the river at a point in the rocky narrows above the old dam is attached hereto. The foundations at this point are all solid rock. It will be noticed from the profile that there is a controlling rock ledge at the outlet which is only 1.5 feet below present water level, and which would necessitate keeping all the storage head above this level unless the ledge was blown out.

There is sand of good quality on the shores of the lake at various points and also gravel, but the surface gravel is not free from dirt.

The shores of the lake have as a general rule steep slopes and in many places are precipitous, but there is nevertheless some good pine of tie size and larger that would suffer damage by flooding. This is confined, however, to a very narrow strip parallel to the water line.

The map used of this lake shows all the islands as far as could be judged except the very small ones.

This lake is sometimes called Trout Lake.

A 30 ft. rise in level on this lake would add very little to its area.

Lac Des Milles Lacs

The drainage area of this lake is about 620 sq. miles, and the area of the lake surface is 90 sq. miles.

Assuming 4 feet of storage draft available through raising the level and deepening the outlet, this lake would have an impounding capacity of about 10,000 million cubic feet. This volume of storage would be provided by a mean annual run-off of 7 inches from the tributary watershed.

The raising of the level of this lake to any great extent will drown large tracts of muskeg, but without serious damage to timber, most of the low lying timber being tamarac, which is still alive but not liable to damage by flooding. The valuable timber on the lake stands sufficiently high to be outside of any possible flooded area.

The lumber camps on the lake are of no value.

Damage to property by raising the level of this lake would occur at two places:—

(1) *Hogans' Mill.*

Hogan Brothers, of Savanne, are the owners of most of the timber limits on the lake and are the proprietors of a large sawmill on the lake shore two miles west of Savanne Station, on the C. P. R. The sawmill is fully equipped with a complete outfit for lumber, lath and shingles, and is connected by a mile spur line to the C. P. R., besides having more than a half mile of track through the piling yard. There is a bush road from Hogans' Mills to Savanne.

An increase of 3.5 feet over the present level of the lake would not damage the mill. Any higher level than this would affect the boiler room of the mill and also the piling yard track, and a 500 foot wharf and storehouse.

The other buildings, residences, storehouses, offices, etc., belonging to the mill are all between ten and twelve feet above the level of the lake.

(2) *At Savanne.*

Taking the level of the lake as 100, the elevations of buildings and railway at Savanne are given below:—

C.P.R. Bridge over Creek	Base of rail = 110.9. Bottom of girder = 107.7.
F. Edward's store and Post Office	Floor El. = 105.0. Cellar Floor El. = 101.0. Floor of Warehouse El. = 103.0. 2 Barns = 103.0.
Ice House	El. of Floor = 102.5.
Station Lavatories	El. of Floor = 103.0.
Other C.P.R. buildings—station, tool houses, section house, etc.	El. of Floors = 108-110.
Road Bridge, 150 feet long	El. of Floor = 103.8.
C.P.R. track, 1 mile each side of the river to rising grade	Base of Rail = 110.9.
Six frame and log houses	El. of Floors = 104-105.
One log house south of C.P.R. track	El. of Floor = 104.5.

The above list includes all the habitable or used buildings at Savanne.

The buildings on the Indian Reserve are all above any possible flood level.

The residents at Savanne state that the river level varies a foot in elevation with changes in the wind.

Some of the above-mentioned houses have cellars which are at present below the ordinary spring flood level.

The muskeg surrounding that branch of the river passing under the C. P. R. bridge extends two and a half miles north of the C. P. R. at an elevation of 2 feet to 3 feet above the present level of the lake.

White Otter or Big Clearwater Lake

The drainage area of this lake above the present dam is about 320 sq. miles, and the area of lake area above the dam is about 50 sq. miles. With 7 feet of storage draft on this lake there would probably be more than sufficient capacity to impound the mean annual run-off of the tributary watershed.

Within the last two years a dam has been erected at the outlet of this lake capable of holding at least 7 feet of water on the sills, but a controlling ledge of rock in the outlet just above the dam makes it doubtful if the lake could be drained as low as the sill.

The timber on this lake is practically all above any damage from flood water.

There are a few old lumber camps on the lake, but these are also above any possible storage level.

There is a gully not far from the present dam that would permit the water to flow out before the water would rise to the crest of the present dam.

There are several low places above the present dam without timber which would be flooded, but high ground is close in every case.

East Clearwater Lake

The drainage area of the lake is about 75 sq. miles, and the area of the lake surface above the outlet is about 12.4 sq. miles.

There is a storage dam at present at the lake which was built at the time of the installation of the power plant of the Hammond Reef Mine some thousand feet below the dam.

The dam is in good condition, though the sluice gate screw block is damaged and the gate has to be levered up and down. The dam is built of stone-filled cribs and well backed with dry masonry, all on rock foundations. The sluice gate is a single steel plate, braced with angle steel and was operated by a screw block above the gate.

The extreme high water-mark is below the level of the top of the dam, which has more than sufficient capacity to hold all the water delivered to the lake.

The shores of the lake are steep sloping rock with no good timber at all near the water line.

MUSKOKA RIVER STORAGE

General Conditions

The watershed of the North Branch of the Muskoka River lies in the districts of Muskoka, Parry Sound and Nipissing, and covers an area of about 560 sq. miles above Port Sydney.

Until recently, the paramount industry in this territory has been lumbering, and for many years the North Branch has been used for the transportation of saw-logs.

Under ordinary conditions, log-driving seriously hampers power development, but a peculiar feature of the situation as regards the Muskoka River is that injury is now being caused not through the activity of the lumbermen, but through the *cessation* of their operations in the upper watershed. This is due to the nature and location of the lake areas.

In the lower portion of the watershed is a group of four large lakes, all but one practically on the same level. In the upper watershed is a large number of small lakes, which have in the past been controlled by lumbermen's dams. When lumbering operations were at their height, large quantities of water were held in these upper lakes, and they were flushed out more or less in succession in bringing drives down the main river and out of tributary streams. The water thus liberated discharged into the group of larger lakes above mentioned, and through their capacity for storage they reduced and equalized the various flood peaks, and discharged them more gradually into the lower river. As the lumbering industry waned, the quantity of water stored in the upper lakes was reduced, and the dams began to suffer from lack of maintenance, the result being that an increasing proportion of the spring run-off discharged naturally into the lower basin, and drained off in the early part of the summer.

The result has been that, while power has been developed upon the river on the basis of a minimum flow which existed 10 years ago, the minimum flow during the last three or four years has dropped as low as 120 second feet at High Falls, or less than half the flow which was ordinarily supposed to obtain 10 years previous. A large part of the capital invested has on this account become unproductive, and long and frequent periods of inadequate service have caused much trouble and inconvenience, as well as a serious loss of revenue.

The object of the investigation is to determine to what extent artificial storage can be used to improve present conditions.

Lumbering

The oldest established industry in the Muskoka River watershed is lumbering, but owing to the fact that practically all the pine has been cut, the waters of the North Branch are now very little used for driving purposes, and in two or three years' time, the use of the waters for this purpose will practically cease. For this reason, it dees not seem necessary to consider the lumbering interest in connection with any scheme having as its object the improvement of flow conditions on the North Branch of the Muskoka River.

Navigation

The navigation interests in the watershed of the North Branch are mainly represented by the Huntsville & Lake of Bays Navigation Co. This company operates boats out of Huntsville, upon Fairy, Mary and Peninsula Lakes, and the connecting channels. The business of the company on these lakes is confined

almost exclusively to the handling of local tourist traffic and through tourist traffic to the Lake of Bays. Open navigation exists between Huntsville and Peninsula Lake, and connection with Mary Lake is made by means of a lock.

Several passenger steamers are kept in commission during the tourist season. The largest boat on the Huntsville-Portage route is 125 feet long, 22 ft. beam and has a maximum draft of about 7 feet. The largest boat on the Mary Lake route has a maximum draft of 6 feet, and has a length and beam specially adjusted for the dimensions of the lock.

As to the commercial use which may in future be made of these waters for navigation purposes, it would seem that the limit of their utility would be the bearing of a tourist traffic not very greatly in excess of that now existing. This opinion may be justified on the following grounds.

(1) That the cutting out of the pine timber has destroyed any lake commerce that has previously existed in connection with the lumber industry.

(2) That the desertion of farms in the townships bordering on these lakes indicates that they will be used less in the future, in connection with the commercial needs of agriculture, than they have been in the past.

(3) That the continual opening up of new tourist districts by the railways will tend to check any abnormal expansion of the tourist traffic out of Huntsville.

It will be assumed, therefore, that the requirements of navigation will be adequately met by providing for the permanent accommodation of boats similar to those now operating.

The minimum depth of channel between Huntsville and the Portage will, therefore, be 8 feet, and 7 feet between Fairy Lake and Port Sydney.

Power

In the year 1892, the Town of Bracebridge puts its No. 1 Hydraulic plant in operation in the Muskoka River, a 16 foot head being developed for lighting load only. This plant is now used exclusively for municipal pumping.

In 1901, plant No. 2 was built, and a 250 kw. unit installed. In 1908 it was found necessary to add a 300 kw. unit.

In 1909, the growing demand for power led to the building of No. 3 plant at Wilson's Falls. This site is now developed to full capacity, 600 kw. being installed.

At the present time, the town has over 2,000 h.p. of wheel capacity installed, and a continuous market demand of 1,500 to 1,800 h.p. Under the low water conditions which have obtained during recent years, about 25 per cent. only of this installed capacity has been capable of use, and for weeks at a time the town has been obliged to carry a commercial load of 1,800 h.p. with a maximum plant output of about 550 h.p.

It is quite evident that the continued occurrence of these periods of power shortage would ultimately ruin the municipal system, as manufacturers would be forced to install a more dependable type of motive power.

In view of the above, it is unnecessary to emphasize the urgent need of improving the flow characteristics of the North Branch of the Muskoka River. The obvious means of effecting such improvement is by the storage of surplus run-off in the navigable lakes, or in the smaller lakes of the upper watershed.

Storage Possibilities

The choice of initial storage development lies between the group of four navigable lakes above Port Sydney, and a larger number of very much smaller lakes on the upper watershed above Lake Vernon.

As regards the latter, the complete development of the larger lakes would provide approximately 60,000 acre feet of storage. To obtain this, it would be necessary to repair and maintain seven to ten timber dams. Owing to the small storage capacity of the individual basins, more or less constant attention would be necessary for proper operation, and the inaccessible location of most of these basins would be detrimental to operation, both as regards cost and efficiency.

Another disadvantage consists in the fact that stored water from the upper system of lakes must pass through and be partially absorbed by the large lakes above Port Sydney. The influence of wind and temperature on these lakes will make it impossible to foretell with any degree of accuracy what effect the flushing out of a basin would have on the regimen of the lower river, or in what time the effect would become noticeable.

The obvious solution of this latter difficulty is, of course, to use the navigable lakes as auxiliary storage basins. This has actually been done through the agency of the Government dam at Port Sydney.

Having established the fact that the navigable lakes must in any case be used to some extent in connection with any storage scheme that may be devised, the question arises as to whether the storage of these lakes could be developed sufficiently to dispense altogether, or in part, with the necessity of developing the upper system.

The combined area of the four lakes involved is such that about 10,000 acre feet of storage is available for each foot of rise. The importance of obtaining the maximum possible range of variation in level is therefore evident, and the whole point at issue is to determine a range of variation which will, on the one hand, cause no extensive damage by flooding, and, on the other, permit minimum navigable levels to be permanently maintained.

Results of Surveys

The investigations of this problem necessitated the making of surveys covering:—

(1) A new site for a dam at Port Sydney.

(2) Flood contours around Mary Lake.

(3) Survey, with soundings of:—

(*a*) Channel between Lake Vernon and Fairy Lake.
(*b*) Channel between Fairy Lake and Peninsula Lake.
(*c*) Channel between Fairy Lake and the Lock.
(*d*) Channel between the Lock and Mary Lake.

These surveys were of service in reaching certain conclusions which may be summarized as follows:—

(1) That the maximum regulated level of Mary Lake could be held 3 feet above the ice level which obtained at the time of the survey, without causing undue damage.

(2) That the maximum regulated level above the Lock should be held at, or slightly below, high water level, corresponding to about 8.5 feet on the upper sill of the present lock.

(3) That a 3 foot variation of level above the lock, during the navigation season, will not injuriously affect navigation or riparian owners.

(4) That a 4 foot variation of level below the Lock during the navigation season will not injuriously affect navigation, and will not cause serious injury to riparian owners.

New Construction and Improvements

The existing dam at Port Sydney is a wooden structure built by the Provincial Government for maintaining navigation between Port Sydney and the Lock. This dam now requires to be replaced, and, in the interests of economy and efficiency, a permanent structure should be built.

The Lock between Mary and Fairy Lakes is in a dilapidated condition, as is also the dam. The useful life of the dam might be prolonged by extensive repairs, but the lock requires to be entirely rebuilt. All new construction at this point, whether lock or dam, or both, should be permanent.

In the narrow channels between the lakes, the back-wash of the boats cuts away the banks, and the consequent silting up of the navigable channels necessitates frequent dredging. This silting action could be effectively stopped by pile sheeting the exposed sections. The whole length of the channel between Fairy and Peninsula Lakes should be treated in this way, and also certain portions of the channel between the Lock and Mary Lake.

All of the above new construction is required in the interests of navigation, and any additional features of design in connection with these structures, which might be necessary in order to adapt them for storage regulation, would be insignificant from a cost standpoint.

The surveys also indicated that the storage capacity of the lakes above Port Sydney could be economically increased by deepening some of the connecting channels between the lakes. This work would of course be to a large extent chargeable to storage.

Details of General Scheme

The projected general scheme of improvement is shown on the sketch profile hereto attached.

The dam at Port Sydney is to be designed so as to enable the levels of Mary Lake to be held between El. 23 and El. 27 during the navigation season, and to allow for an additional drop of two feet during the fall and winter.

The bottom of the navigable channel between Mary Lake and the Lock has been set at El. 16. Inspection of the large scale plans of Sections D. and E. indicates that a small amount of excavation may be necessary through the sandbar at the mouth of the river. Some soft dredging will also be required just below the lock.

At the Lock, it is proposed to drop the lower guard sill to El. 15, and the mitre sill to El. 14. The upper guard sill is dropped to El. 23, and the mitre sill to El. 22. There will thus be 8 feet of water on the lock sills under the minimum projected summer level.

With a tight permanent dam at Port Sydney, a permanent dam at the Lock is not absolutely necessary, and present requirements will be met if the latter is repaired and alterations made which will enable it to hold the level above the Lock within the extreme limits of variation shown on the sketch profile, namely, El. 34 maximum, and El. 29 minimum.

The large scale plan of Section C. shows that for a bottom elevation of 24, no dredging or other improvement of the navigable channel will be necessary.

The general scheme, as described up to this point, provides for a navigable channel 60 feet wide, with a minimum depth of 7 feet, between Fairy Lake and Port Sydney, with 8 feet minimum on the guard sills of the Lock, so that an 8 foot channel could be provided in the future by dredging.

Apart from the general statement made above, as to the ultimate requirements of navigation, no definite recommendations are made regarding the dimensions of the proposed new lock. In this connection however, it may be pointed out that the present lock has ample dimensions to accommodate present traffic. If the lock were enlarged to accommodate the largest boat of the Navigation Co., probably all of the Mary Lake traffic could be handled by one boat making one round trip per day, or, at most, two, during the height of the tourist season. The enlargement of the lock, therefore, would not benefit the district as a whole, but would simply enable the Navigation Co. to handle all the Mary Lake traffic with one large boat, using the lock two to four times per day, for three months of the year, as against a use of four to eight times per day with a lock of present dimensions and smaller boats.

The large scale plans of Sections A and B indicate the extent of improvement necessary to provide a 60 foot channel having a minimum depth of 8 feet between Huntsville and the Portage.

The plan of Section A, Huntsville to Fairy Lake, shows that the amount of dredging is insignificant.

The plan of Section B, Fairy Lake to Peninsula Lake, shows that the present dredged channel will require deepening from end to end, the cut, however, being very light, averaging little over one foot.

Storage Capacity and Results

The adoption of the above described scheme would make 3 feet of draft available in summer, and 2 feet additional in winter, upon Vernon, Fairy and Peninsula Lakes, making in all 5 feet of draft available.

Under similar conditions, 4 feet of draft will be available on Mary Lake during the navigation season, and 2 feet additional in the winter, making 6 feet available in all.

The combined area of Vernon, Fairy and Peninsula Lakes, is about 7,600 acres. The area of Mary Lake is about 2,600 acres.

On the basis of the above figures for area and storage draft, the four lakes in question would provide 32,800 acre-feet of storage during the navigation season.

The benefit to be derived from this volume of storage will be proportional to the length of the low water season, which will vary from year to year. The continuous supply from storage alone, for seasons of various lengths, would be as follows:—

107	days	from July 17 to Oct. 31	155 second feet
92	"	Aug. 1 to Oct. 31	179 "
76	"	Aug. 1 to Oct. 15	210 "
61	"	Aug. 1 to Oct. 1	271 "

Under the worst possible conditions that could be imagined the watershed of the Muskoka River above Port Sydney should produce a natural minimum run-off of one-tenth of a second-foot per square mile of watershed. This would mean a natural low water discharge of 56 sec. ft. at Port Sydney.

If the flow from storage under various conditions be superimposed upon this natural discharge, the figures given above will become 211, 235, 274 and 327 sec. ft. respectively. These latter figures fairly cover the range of benefit to be derived from the utilization, during the navigation season, of 32,800 acre-feet of storage on Vernon, Fairy, Peninsula and Mary Lakes.

As to winter storage, it has been assumed that 2 ft. additional could be drawn off the lakes after the close of navigation. Assuming no fall replenishment, there would be 20,200 acre-feet of storage available, to meet low water conditions during the winter. Two months' use of winter storage would probably cover the worst condition; say from Jan. 15 to March 15. Over this period, the above specified volume of storage would provide a continuous flow of 169 sec. ft., which, superimposed upon a natural minimum of 56 sec. ft., would mean a continuous supply of 225 sec. ft. under the worst winter conditions to be anticipated.

Land Damages and Navigation

On the basis of the limits of draft above prescribed, the use of the navigable lakes above Port Sydney for storage purposes will cause no appreciable injury to navigation, and only such inconvenience as may be caused at wharves and landing stages by the proposed 3 to 4 foot variation of level.

The summer cottages on the shores of the various lakes constitute the principal item in connection with land damages. The proposed maximum regulated level of the upper lakes is less than one foot above the ice level of the winter of 1913, and the minimum regulated summer level is to be about 2 feet below ice level. This range of variation is probably much less than that which would obtain under natural conditions, so that the proposed scheme of regulation should be beneficial as far as the upper lakes are concerned, and no damages should accrue.

In the case of Mary Lake, the proposed maximum regulated level is about 3 feet above the ice level of 1913, and the summer minimum about one foot below. There are several points on the shore of Mary Lake where damage may be caused by the maintenance of the projected maximum level.

The present intake of the Smith Mill at Port Sydney should be torn out, and a new one built as part of the proposed new dam. The only justifiable claim for compensation in this regard would be in connection with the land necessary for the extension of the dam, and possibly for a small amount of flooding above the same.

Conclusion

In the event of the projected scheme being approved, but full completion of the work not authorized, the different items should be handled in order of their importance, as follows:—

(1) The building of a new dam at Port Sydney.

(2) The building of a new lock between Mary and Fairy Lakes.

(3) The building of a new dam at the lock or the repair of the present one.

(4) Deepening of channel and shore protection between Fairy and Peninsula Lakes.

(5) Deepening of channel and shore protection between the Lock and Mary Lake.

Assuming that the scheme as outlined is feasible, its superiority over any scheme involving the small lakes in the upper watershed is entirely obvious. The outstanding points of advantage are, first, the greater accessibility of the works, and, second, the vastly greater degree of precision with which the flow can be regulated, if properly designed works are placed at the Lock and at Port Sydney. The facilities thus afforded for efficient regulation would more than offset any advantage the upper lakes might have as regards aggregate storage capacity.

The complete development of the storage of the lower lakes will also allow the storage of the upper lakes to be properly utilized at very small cost, should the necessity arise. It would simply be necessary, in this case, to keep the wooden dams in a fair state of repair, and to flush out the various small lakes in rotation whenever the stage of the lower lakes was such as to permit the reception of the additional supply.

The cost of operating and maintaining the upper system under such circumstances would be comparatively insignificant.

In conclusion it may be noted that the development of artificial storage for power purposes on navigable lakes is not by any means a new idea. The navigable lakes on the Trent and Rideau systems have been used for storage purposes for years, and the range of level variation which obtains on the navigable lakes included in both of these systems is much greater than that contemplated in the case under discussion. Furthermore, in the case of the Trent Canal a through navigation route is involved, where the interests of shipping will be of vastly greater importance as compared to those of power than they can ever hope to be on the lakes above Port Sydney.

Toronto, Oct. 31, 1913.

SEVERN RIVER

The drainage area of the Severn River above the power site at Wasdell's Falls is about 2,080 sq. miles. About 700 sq. miles of this area is included in the watershed of the Black River, which joins the Severn about midway between Wasdell's Falls and the outlet of Lake Simcoe at Washago. The maximum flow at Wasdell's Falls, as so far ascertained from gauge records and discharge measurements, is 9,000 second-feet or 4.32 second-feet per square mile of watershed. Under conditions that will obtain in the future, it is probable that the maximum discharge will never exceed 5 sec. ft. per square mile, this low figure being due mainly to the potent regulating influence of Lake Simcoe, and to a small extent to the smaller lakes in the upper watershed.

The extreme minimum flow, during the period that the river has been under observation by the Commission, was 260 sec. feet, or .125 second-feet per square mile. The average flow for the period from October 1, 1912, to Nov. 1, 1913, was 2,850 second-feet, or 1.37 second-feet per square mile. This was one of the driest periods on record, so that the above is a fair indication of the minimum value of mean annual flow. On this basis the ratio of maximum to average flow is approximately as 3 to 1.

The area of Lake Simcoe is about 297 square miles, and when the Severn section of the Trent Canal is constructed the lake will be completely controlled by regulating dams at Washago. An annual storage draft of 18 inches may then reasonably be considered available, in which event the volume of available storage will be 12,420 million cubic feet or 284,500 acre-feet.

The plant at Wasdell's Falls is designed for a peak capacity of 1,200 h.p. The Trent Canal works are designed to hold the tail-water level at elevation 698, and with the proposed head-water level of elevation 712.5, about 950 second-feet of flow will be required to carry the peak load. On a 75 per cent. power factor basis the average flow will therefore require to be 700 second-feet.

The available volume of storage above specified will provide the required average flow for 207 days in each year. Leaving an ample margin for unavoidable waste and inefficiency of operation, it is therefore evident that a sufficient supply of water may be anticipated at all times.

The Black River, being deficient in natural storage capacity, is very flashy and the peak in evidence on the attached daily discharge curve is mainly due to the sudden rise of the Black River in the spring. In spite of this, the curve shows that the regimen of the river is better than the average. An example of the other extreme is shown in the case of the Maitland River hydrograph. This river lacks natural storage capacity to an unusual degree, and a comparison of the two curves serves to illustrate most admirably the great influence exercised by natural storage upon the regimen of a stream.

Daily Gauge Height and Discharge of Severn River, at Severn Bridge, for 1913

Drainage area, 2,075 square miles

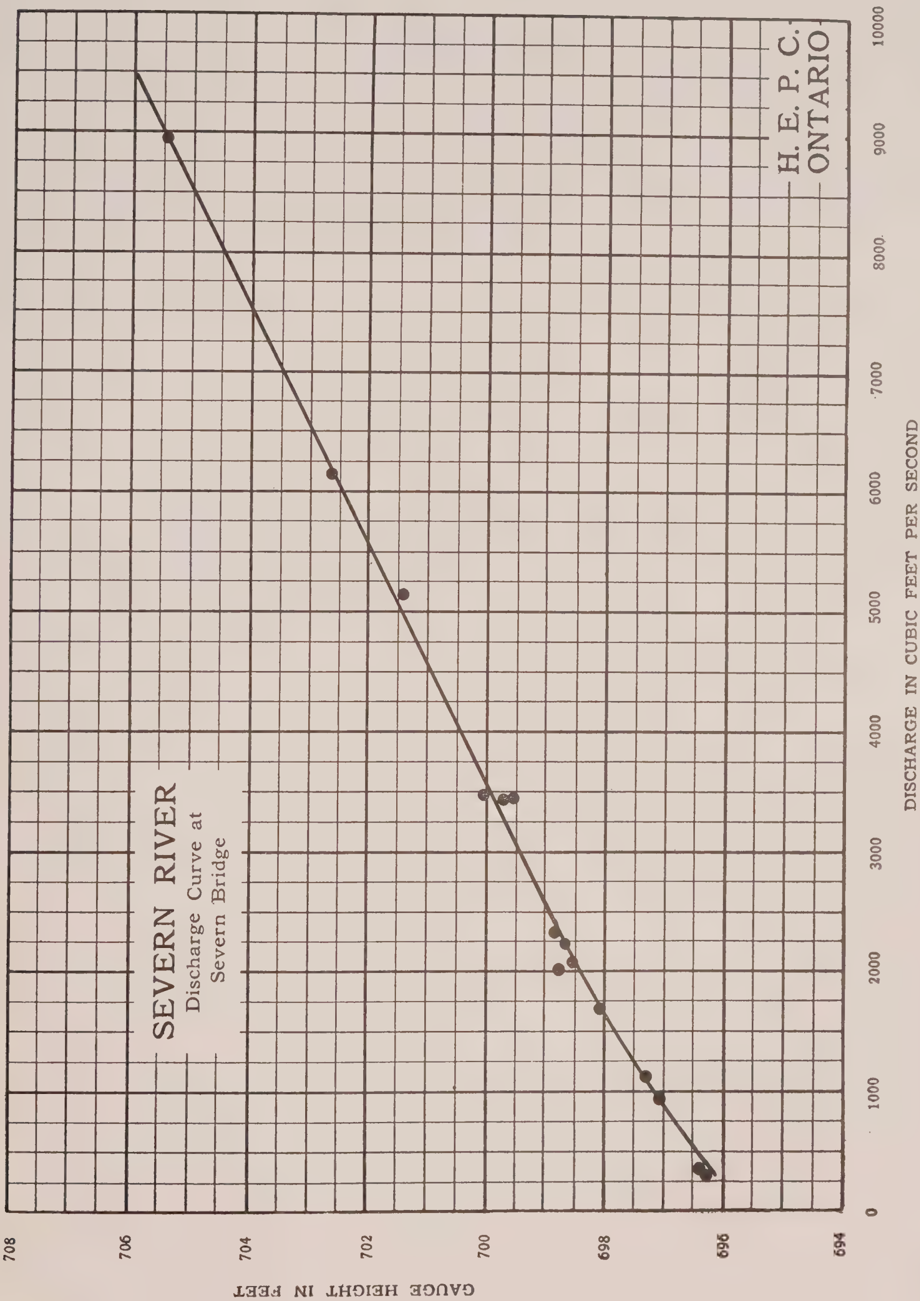
Day	January Gauge Ht.	January Dis-charge	February Gauge Ht.	February Dis-charge	March Gauge Ht.	March Dis-charge	April Gauge Ht.	April Dis-charge	May Gauge Ht.	May Dis-charge	June Gauge Ht.	June Dis-charge	July Gauge Ht.	July Dis-charge	August Gauge Ht.	August Dis-charge	September Gauge Ht.	September Dis-charge	October Gauge Ht.	October Dis-charge	November Gauge Ht.	November Dis-charge	December Gauge Ht.	December Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	......	.....	......	.....	......	.....	......	*8725	701.93	5525	699.80	3375	698.62	2200	697.31	1075	697.22	1010	696.81	740	......	.....	......	.....
2	......	.....	......	.....	......	.....	......	*8670	701.87	5450	699.74	3325	698.58	2150	697.16	950	697.26	1025	696.81	740	......	.....	......	.....
3	......	.....	......	.....	......	.....	......	*8600	701.73	5300	699.64	3225	698,47	2025	697,07	900	697.26	1025	696.81	740	......	.....	......	.....
4	......	.....	......	.....	......	.....	......	*8900	701.60	5175	699.58	3175	698.41	1975	697.03	875	697.26	1025	696.89	790	......	.....	......	.....
5	......	.....	......	.....	......	.....	705.47	9050	701.50	5075	699.45	3050	698.32	1900	696.95	825	697.26	1025	696.89	790	......	.....	......	.....
6	......	.....	......	.....	......	.....	705.39	8950	701.39	4975	699.51	3100	698.24	1825	696.93	810	697.24	1020	696.89	790	......	.....	......	.....
7	......	.....	......	.....	......	.....	705.31	8900	701.22	4800	699.51	3100	698.26	1850	696.90	800	697.22	1010	697.05	875	......	.....	......	.....
8	......	.....	......	.....	......	.....	705.28	8850	701.05	4625	699.45	3050	698.22	1810	696.95	825	697.13	945	697.05	875	......	.....	......	.....
9	......	.....	......	.....	......	.....	705.12	8600	700.89	4475	699.37	2950	698.14	1750	697.00	850	697.06	890	697.05	875	......	.....	......	.....
10	......	.....	......	.....	......	.....	705.07	8625	700.76	4350	699.26	2850	698.07	1675	697.01	750	696.99	845	697.05	875	......	.....	......	.....
11	......	.....	......	.....	......	.....	705.09	8650	700.74	4325	699.22	2800	697.99	1625	697.01	855	696.97	835	696.99	845	......	.....	......	.....
12	......	.....	......	.....	......	.....	705.05	8600	700.59	4175	699.16	2750	697.99	1625	697.01	855	696.95	825	696.93	810	......	.....	......	.....
13	......	.....	......	.....	......	.....	704.93	8500	700.55	4150	699.08	2650	697.99	1625	697.05	875	696.93	810	696.59	590	......	.....	......	.....
14	......	.....	......	.....	......	.....	704.80	8375	700.51	4125	698.93	2525	697.95	1600	697.07	900	696.85	760	696.59	590	......	.....	......	.....
15	......	.....	......	.....	......	.....	704.66	8225	700.45	4050	698.88	2475	697.93	1575	697.09	925	696.76	700	696.47	525	......	.....	......	.....
16	......	.....	......	.....	......	.....	704.61	8175	700.34	3950	698.80	2375	697.86	1500	697.14	950	696.85	760	696.28	410	......	.....	......	.....
17	......	.....	......	.....	......	.....	704.43	8000	700.34	3950	698.76	2325	697.93	1575	696.18	990	696.76	700	696.18	370	......	.....	......	.....
18	......	.....	......	.....	......	.....	704.30	7875	700.34	3950	698.71	2275	697.99	1625	697.18	990	696.76	700	696.26	400	......	.....	......	.....
19	......	.....	......	.....	......	.....	704.16	7725	700.32	3925	698.87	2450	697.99	1625	697.18	990	696.76	700	696.11	315	......	.....	......	.....
20	......	.....	......	.....	......	.....	703.93	7500	700.14	3750	698.82	2400	697.95	1600	697.18	990	696.76	700	696.15	350	......	.....	......	.....
21	......	.....	......	.....	......	.....	703.64	7225	700.10	3700	698.87	2450	697.93	1575	697.18	990	696.76	700	696.11	315	......	.....	......	.....
22	......	.....	......	.....	......	.....	703.49	7075	700.12	3725	698.97	2560	697.91	1550	697.18	990	696.76	700	695.99	275	......	.....	......	.....
23	......	.....	......	.....	......	.....	703.30	6900	700.10	3700	698.91	2500	697.86	1500	697.18	990	696.85	760	695.97	260	......	.....	......	.....
24	......	.....	......	.....	......	.....	703.03	6600	700.10	3700	698.87	2450	697.80	1450	697.20	1000	696.76	700	696.05	285	......	.....	......	.....
25	......	.....	......	.....	......	.....	703.78	7350	700.10	3700	698.87	2450	697.89	1525	697.18	990	696.76	700	695.97	260	......	.....	......	.....
26	......	.....	......	.....	......	.....	702.41	6000	700.03	3625	698.91	2500	697.84	1475	697.18	990	696.76	700	696.05	285	......	.....	......	.....
27	......	.....	......	.....	......	.....	702.30	5900	699.95	3550	698.85	2425	697.81	1460	697.18	990	696.76	700	696.42	500	......	.....	......	.....
28	......	.....	......	.....	......	.....	702.22	5800	699.86	3450	698.82	2400	697.76	1425	697.18	990	696.76	700	696.50	550	......	.....	......	.....
29	......	.....	......	.....	......	.....	702.07	5650	699.84	3425	698.76	2325	697.76	1425	697.20	1000	696.81	740	696.50	550	......	.....	......	.....
30	......	.....	......	.....	......	.....	702.01	5600	699.80	3375	698.66	2225	697.58	1285	697.22	1010	696.85	760	696.50	550	......	.....	......	.....
31	......	.....	......	.....	......	.....	......	.....	699.80	3375	......	.....	697.45	1175	697.26	1025	......	.....	696.50	550	......	.....	......	.....

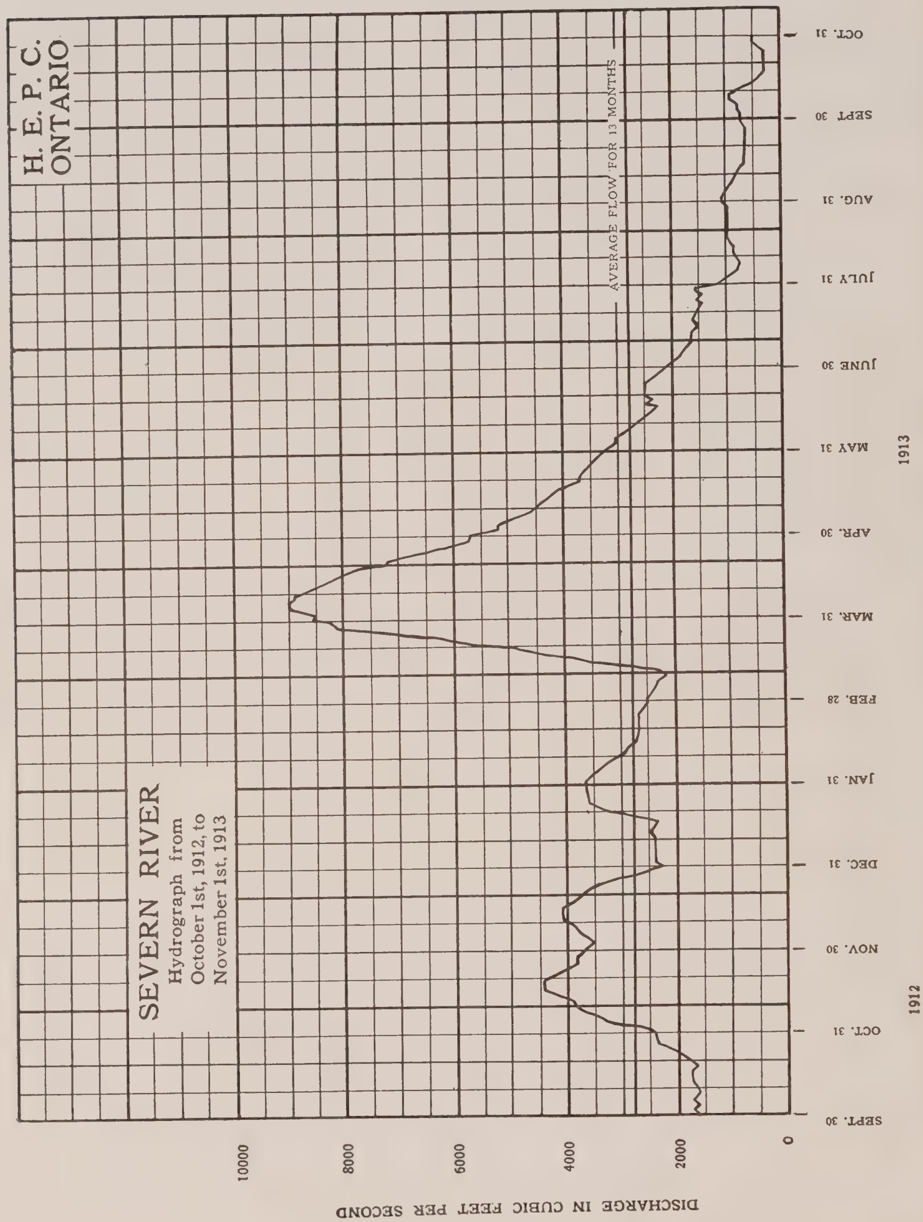
* Estimated.

Monthly discharge of Severn River at Severn Bridge for year 1913

Drainage area, 2,075 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off,
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	9,050	5,600	7,790	4.36	2.70	3.76	4.20
May	5,525	3,375	4,175	2.66	1.63	2.01	2.32
June	3,375	2,225	2,680	1.63	1.07	1.29	1.44
July	2,200	1,175	1,644	1.06	.57	.79	.91
August	1,075	800	937	.52	.39	.45	.52
September	1,025	700	815	.49	.34	.39	.43
October	875	260	570	.42	.13	.27	.31
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	9,050	260	2,659	4.36	.13	1.28	10.13


SEVERN RIVER
Discharge Curve at
Severn Bridge
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
GAUGE HEIGHT IN FEET
694
696
698
700
702
704
706
708



H. E. P. C.
ONTARIO
SEVERN RIVER
Hydrograph from
October 1st, 1912, to
November 1st, 1913
AVERAGE FLOW FOR 13 MONTHS
SEPT. 30
OCT. 31
NOV. 30
DEC. 31
JAN. 31
FEB. 28
MAR. 31
APR. 30
MAY 31
JUNE 30
JULY 31
AUG. 31
SEPT 30
OCT. 31
1912
1913
10000
8000
6000
4000
2000
0
DISCHARGE IN CUBIC FEET PER SECOND

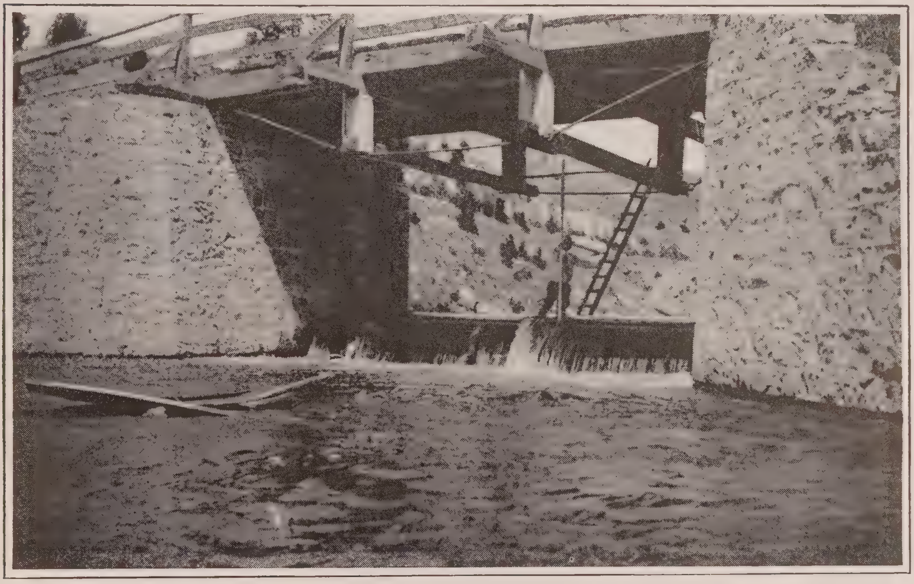
BEAVER RIVER

The proposed hydro-electric development for the supply of power for Owen Sound, and the neighboring district, will be located at Eugenia Falls on the Beaver River.

By the construction of a dam to conserve the flow of the stream, a gross head of 520 feet can be obtained.

A report on the power possibilities of the Beaver River was made in the Third and Fourth Annual Reports of the Commission, page 190. Some additional information regarding the hydrology of the Beaver River at Eugenia is presented herewith.

The data from which the following results were derived are weir records of the flow of the Beaver River at Eugenia for the year ending June 30th, 1911.



Measuring Weir—Eugenia

From the daily readings of the gauge height at the weir, the daily discharges of the river were computed, and these results are used in the following analysis.

To compute the amount of yield of the watershed from this series of gaugings, and to determine the volume of reservoir storage required to store the flood waters in order that any constant rate of flow may be maintained, the mass curve method has been used.

This method consists of totaling the daily discharges of the watershed from day to day for the whole period, which quantities are then plotted as an irregular line, or "mass curve." Any desired rate of draft may then be assumed, and the amounts necessary at different times plotted to the same scale. If a uniform rate, this draft curve forms a straight inclined line, and if it is made to start coincident with some point or summit on the "mass curve," the ordinate between the two curves at any point serves to show the volume of storage that would be required at this date to have maintained the required rate of draft up to that time.

The mass curve, plotted as above outlined, for the period of June, 1910-June, 1911, gives the reservoir capacities necessary to insure certain uniform rates of flow, beginning with 23 cubic feet per second, the minimum flow for the year. These rates of draft, with the required reservoir capacities obtained from the mass curve, are shown in the Diagram of Required Capacity of Reservoir for varying rates of draft. This diagram shows that to secure a uniform flow equal to the mean annual flow (or 65 cubic feet per second), it will be necessary to provide a reservoir capacity of 600 million cubic feet or about 14,000 acre feet. To secure 50 cubic feet per second, 245 million cubic feet of storage or about 5,700 acre feet will be required.

The scheme of development at Eugenia, most economically feasible, is one involving the building of a dam above Eugenia Falls, a diversion canal from the reservoir thus formed, and about 5,000 feet of pipe line for an effective head of 500 feet. The initial development of 2,000 h.p. can be obtained with a dam 23 feet high. When the load builds up sufficiently to warrant extension of the plant, the water to operate an additional unit of 1,000 h.p. can be secured by raising this dam 10 feet. For the final development or full capacity, additional storage can be secured by a dam at Feversham, about 8 miles above Eugenia.

A study of the curves of storage capacities for different contour elevations that have been plotted for dams at Eugenia Falls and at Feversham, and as shown herewith, when analyzed in connection with the reservoir-draft curves, gives the necessary height to which the dams must be carried for any required amount of flow. The results are shown in the following tables. The appended curves of storage capacities for different contour elevations for Eugenia are more or less approximate, and may be changed when further data are obtained from the surveys now in progress.

Table of Estimated Storage Capacities

——	Elevation Crest of Dam	Storage in Million Cubic Feet
Eugenia	533	32
"	543	232
Feversham	105	225
"	110	305

Table Showing Estimated Volume of Flow from Storage

——	Storage in Million Cubic Feet	Uniform Flow in Cubic Feet per Second
Eugenia	32	35
"	232	49
Eugenia Feversham	32 225	50
Eugenia Feversham	32 305	54
Eugenia Feversham	232 225	59
Eugenia Feversham	232 305	62

A reference to the mass-curve indicates that the fall replenishment of storage is very limited for this watershed. This conclusion is borne out by the discharges taken during 1913. Thus the storage reservoirs must impound sufficient water during the months of March, April and May to carry over the rest of the year, since it is impossible to depend on a fall filling.

The problem of determining the proper turbine capacity to install at any power-site is a difficult matter, depending to a great extent on the judgment of the designer. One method of obtaining the economical capacity of a river, to generate power, is by means of a "duration curve." The duration curve is plotted by arranging the several daily discharges in order of their size; *i.e.,* the maximum quantity for any one day in the year is placed as an ordinate over, say, the first day in the year, and so on down to the smallest daily quantity for that year, placed as an ordinate for the three hundred and sixty-fifth or last day of the year. This gives a smooth regular line, as may be seen in the appended duration curve plotted for June, 1910, to June, 1911. From this curve the duration during the year of any given river flow may be directly read off.

Experience on rivers used for water power has shown that, in general, the quantity found to obtain at ordinate 182½ on the curve represents the proper and most efficient turbine capacity that may be installed. A variation of 30 days either side of this ordinate is in cases admissible.

The duration curve for 1910 and 1911 represents the flow of a minimum year, as was noted in the 1911 Report of the Hydro-Electric Commission. On the ordinate 182½ the flow is 43 cubic feet per second, at 152½ the flow is 48 cubic feet per second. It is reasonable to expect that the average flow ordinate at 182½ will be at least 50 cubic feet per second, and at 152½ will be 55 cubic feet per second for an ordinary year.

The development will therefore be planned to use the most economic turbine capacity represented by this flow. The ultimate capacity will, of course, be controlled by the later discharge records which will be obtained during the operation of the plant, and which will give more data for fixing the average flow to be expected. The operating records of the plant will also give the load factor to be expected on the complete ultimate development.

An inspection of the monthly flow tables for the Beaver River during 1910-11-13, shows a very remarkable coincidence of values for the months of low flow. This is due primarily to the fact that the Beaver River is a spring-fed stream in the fullest sense of the term, ground storage capacity existing to an unusual degree. This condition is in turn influenced by the existence of large tracts of undrained and uncleared swamp throughout the watershed.

Daily Gauge Height and Discharge of Beaver River, at Eugenia, for 1913

Drainage area, 74 square miles

Day	January Gauge Ht.	January Dis-charge	February Gauge Ht.	February Dis-charge	March Gauge Ht.	March Dis-charge	April Gauge Ht.	April Dis-charge	May Gauge Ht.	May Dis-charge	June Gauge Ht.	June Dis-charge	July Gauge Ht.	July Dis-charge	August Gauge Ht.	August Dis-charge	September Gauge Ht.	September Dis-charge	October Gauge Ht.	October Dis-charge	November Gauge Ht.	November Dis-charge	December Gauge Ht.	December Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	......	.....	......	.....	......	.....	......	.....	......	.....	2.605	72	2.435	51	2,305	36	2.255	30	2.25	30	2.26	31	2.395	46
2	......	.....	......	.....	......	.....	......	.....	......	.....	2.595	71	2.420	49	2.295	35	2.255	30	2.21	27	2.255	30	2.93	50
3	......	.....	......	.....	......	.....	......	.....	......	.....	2.585	70	2.415	48	2.290	34	2.255	30	2.22	27	2.25	30	2.44	52
4	......	.....	......	.....	......	.....	......	.....	......	.....	2.575	69	2.430	50	2.295	35	2.245	29	2.225	27	2.29	34	2.39	45
5	......	.....	......	.....	......	.....	......	.....	......	.....	2.565	67	2.480	57	2.295	35	2.240	29	2.22	27	2.285	34	2.385	45
6	......	.....	......	.....	......	.....	......	.....	......	.....	2.625	75	2.475	55	2.265	32	2.240	29	2.215	27	2.27	38	2.365	43
7	......	.....	......	.....	......	.....	......	.....	......	.....	2.790	99	2.420	49	2.275	33	2.235	28	2.23	28	2.255	30	2.35	41
8	......	.....	......	.....	......	.....	......	.....	......	.....	2.765	95	2.400	46	2.245	30	2.250	30	2.22	28	2.26	31	2.39	45
9	......	.....	......	.....	......	.....	......	.....	......	.....	2.685	83	2.395	46	2.285	34	2.245	29	2.21	27	2.28	33	2.335	39
10	......	.....	......	.....	......	.....	......	.....	......	.....	2.630	76	2.395	46	2.295	35	2.235	28	2.21	27	2.30	35	2.34	40
11	......	.....	......	.....	......	.....	......	.....	......	.....	2.605	72	2.380	44	2.300	35	2.225	28	2.22	27	2.295	35	2.33	39
12	......	.....	......	.....	......	.....	......	.....	......	.....	2.580	69	2.405	47	2.285	34	2.225	28	2.23	28	2.29	34	2.34	40
13	......	.....	......	.....	......	.....	......	.....	......	.....	2.570	68	2.415	48	2.275	33	2.220	27	2.21	27	2.295	35	2.39	40
14	......	.....	......	.....	......	.....	......	.....	......	.....	2.545	64	2.400	46	2.270	32	2.220	27	2.22	27	2.315	36	2.85	41
15	......	.....	......	.....	......	.....	......	.....	......	.....	2.540	64	2.375	44	2.270	32	2.215	27	2.21	27	2.315	36	2.355	41
16	......	.....	......	.....	......	.....	......	.....	......	.....	2.535	62	2.365	43	2.260	31	2.225	28	2.215	27	2.305	36	2.355	41
17	......	.....	......	.....	......	.....	......	.....	......	.....	2.525	62	2.360	42	2.265	31	2.230	28	2.21	27	2.285	34	2.34	40
18	......	.....	......	.....	......	.....	......	.....	......	.....	2.515	61	2.360	42	2.260	31	2.260	31	2.23	28	2.305	36	2.34	40
19	......	.....	......	.....	......	.....	......	.....	......	.....	2.535	63	2.355	41	2.245	29	2.245	29	2.26	31	2.465	55	2.34	40
20	......	.....	......	.....	......	.....	......	.....	......	.....	2.535	63	2.350	41	2.240	29	2.225	28	2.22	27	2.74	88	2.345	40
21	......	.....	......	.....	......	.....	......	.....	......	.....	2.545	64	2.340	40	2.230	29	2.26	31	2.225	27	2.68	83	2.32	38
22	......	.....	......	.....	......	.....	......	.....	......	.....	2.520	61	2.335	39	2.265	31	2.24	29	2.265	31	2.61	73	2.31	36
23	......	.....	......	.....	......	.....	......	.....	......	.....	2.495	58	2.330	39	3.300	35	2.245	29	2.255	30	2.57	68	2.325	38
24	......	.....	......	.....	......	.....	......	.....	......	.....	2.470	55	2.330	39	2.295	35	2.23	28	2.38	44	2.525	62	2.31	36
25	......	.....	......	.....	......	.....	......	.....	......	.....	2.465	55	2.325	38	2.265	31	2.225	27	2.38	44	2.495	58	2.315	36
26	......	.....	......	.....	......	.....	......	.....	......	.....	2.490	58	2.320	38	2.265	31	2.225	27	2.32	38	2.46	55	2.22	27
27	......	.....	......	.....	......	.....	......	.....	......	.....	2.490	58	2.310	36	2.265	31	2.24	29	2.28	33	2.425	50	2.23	28
28	......	.....	......	.....	......	.....	......	.....	......	.....	2.470	55	2.315	36	2.255	30	2.23	28	2.295	35	2.395	46	2.29	34
29	......	.....	......	.....	......	.....	......	.....	......	.....	2.445	52	2.310	37	2.275	33	2.205	25	2.295	35	2.375	44	2.28	33
30	......	.....	......	.....	......	.....	......	.....	......	.....	2.430	50	2.315	36	2.295	35	2.235	28	2.29	34	2.395	46	2.32	36
31	......	.....	......	.....	......	.....	......	.....	......	.....	......	.....	2.295	35	2.280	33	......	.....	2.23	28	......	.....	2.28	33

Monthly discharge of Beaver River at Eugenia for year 1910

Drainage area, 74 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	58	36	41.4	.78	.49	.57	.65
August	50	29	34.9	.68	.39	.47	.54
September	39	26	28.5	.53	.35	.39	.43
October	48	23	31.6	.65	.31	.43	.44
November	60	35	44.1	.81	.47	.60	.69
December	42	27	35.1	.57	.37	.47	.54
The period	60	23	35.92	.81	.31	.49	3.29

Monthly discharge of Beaver River at Eugenia for year 1911

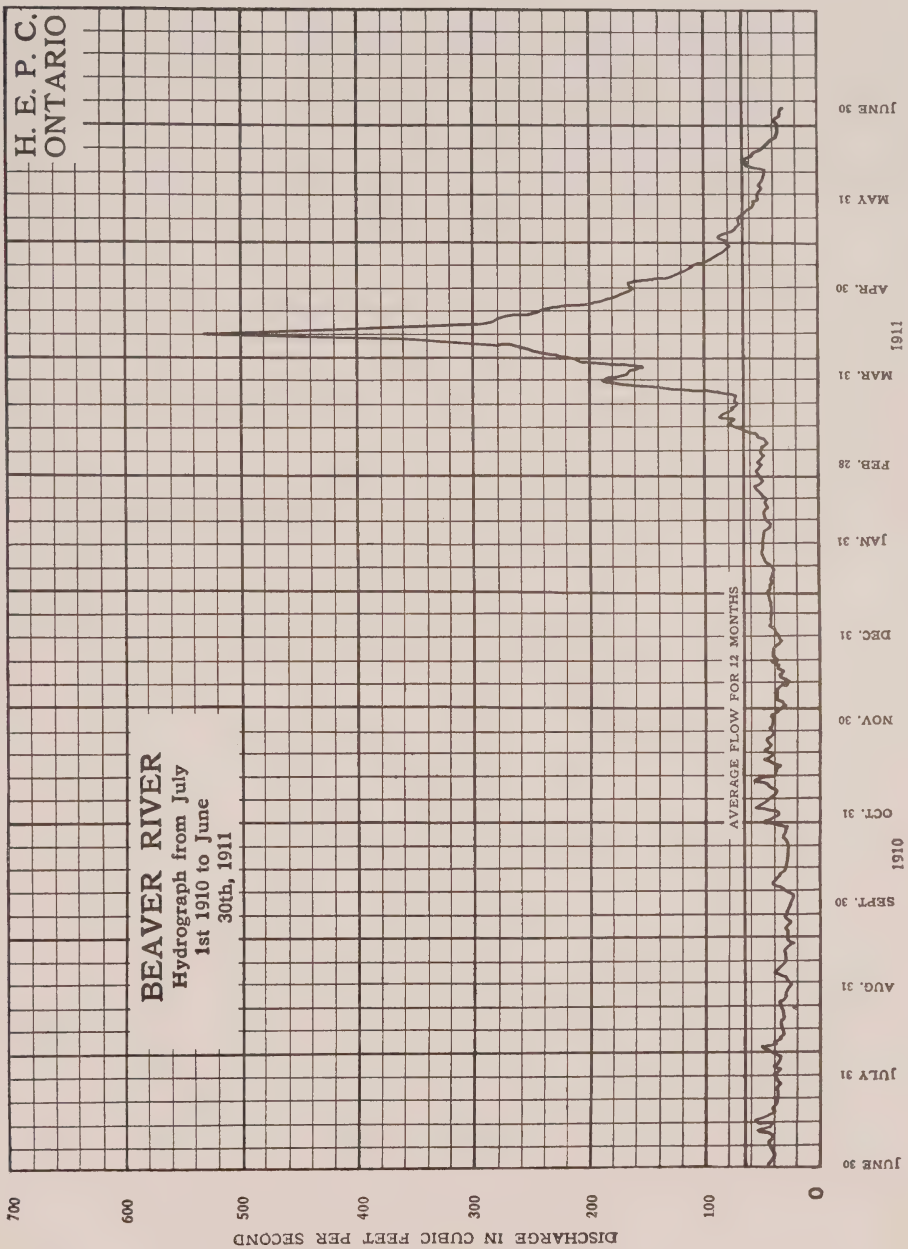
Drainage area, 74 square miles

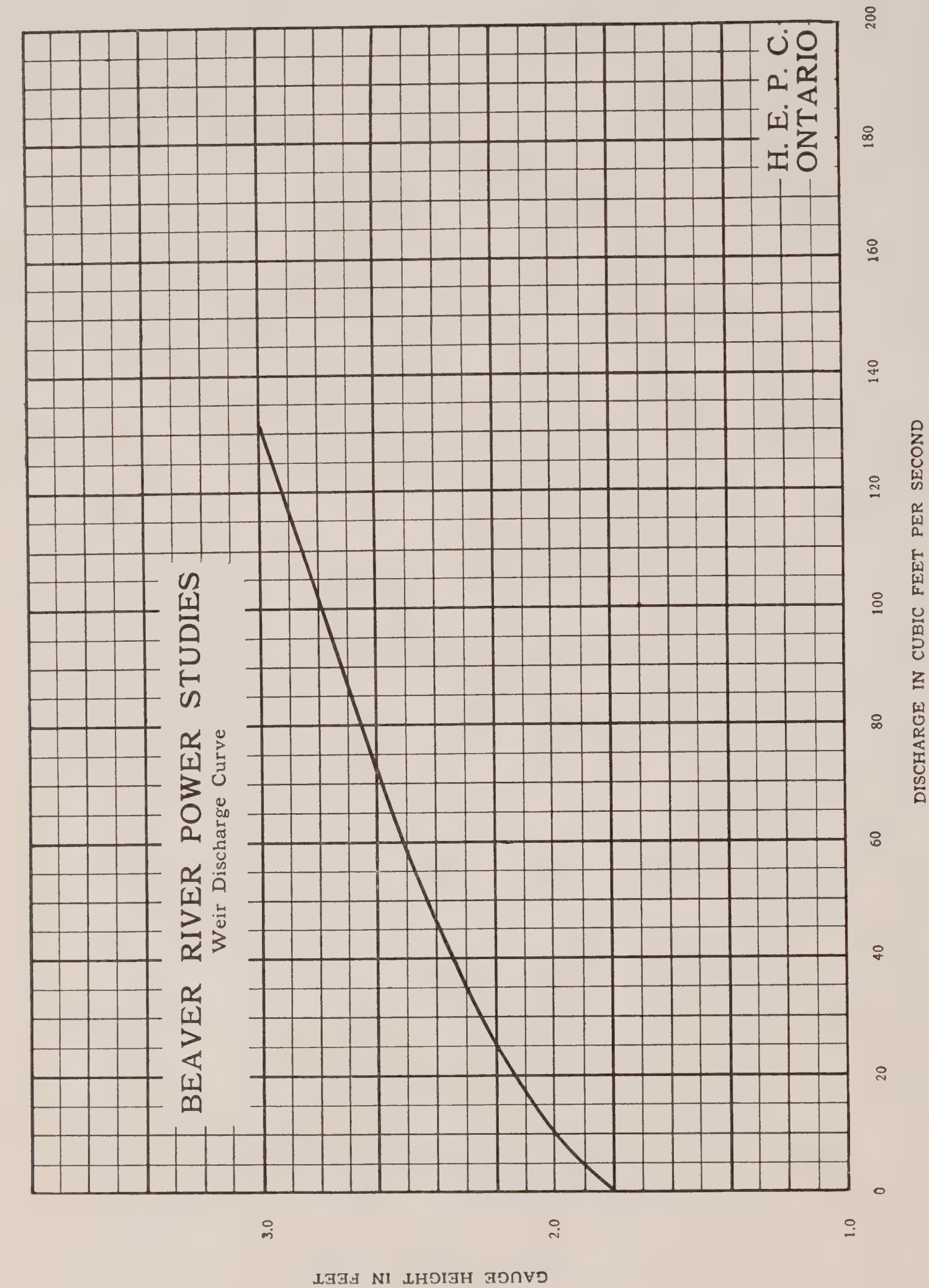
Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	51	36	43.5	.69	.49	.59	.68
February	55	43	49.1	.74	.58	.66	.69
March	192	44	83.6	2.59	.59	1.13	1.30
April	534	151	252.0	7.23	2.04	3.41	3.80
May	166	53	92.2	2.24	.72	1.25	1.44
June	69	32	46.8	.93	.43	.63	.71
July	....	....	....	....	....	....	....
August	....	....	....	....	....	....	....
September	....	....	....	....	....	....	....
October	....	....	....	....	....	....	....
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	534	32	94.53	7.23	.43	1.28	8.62

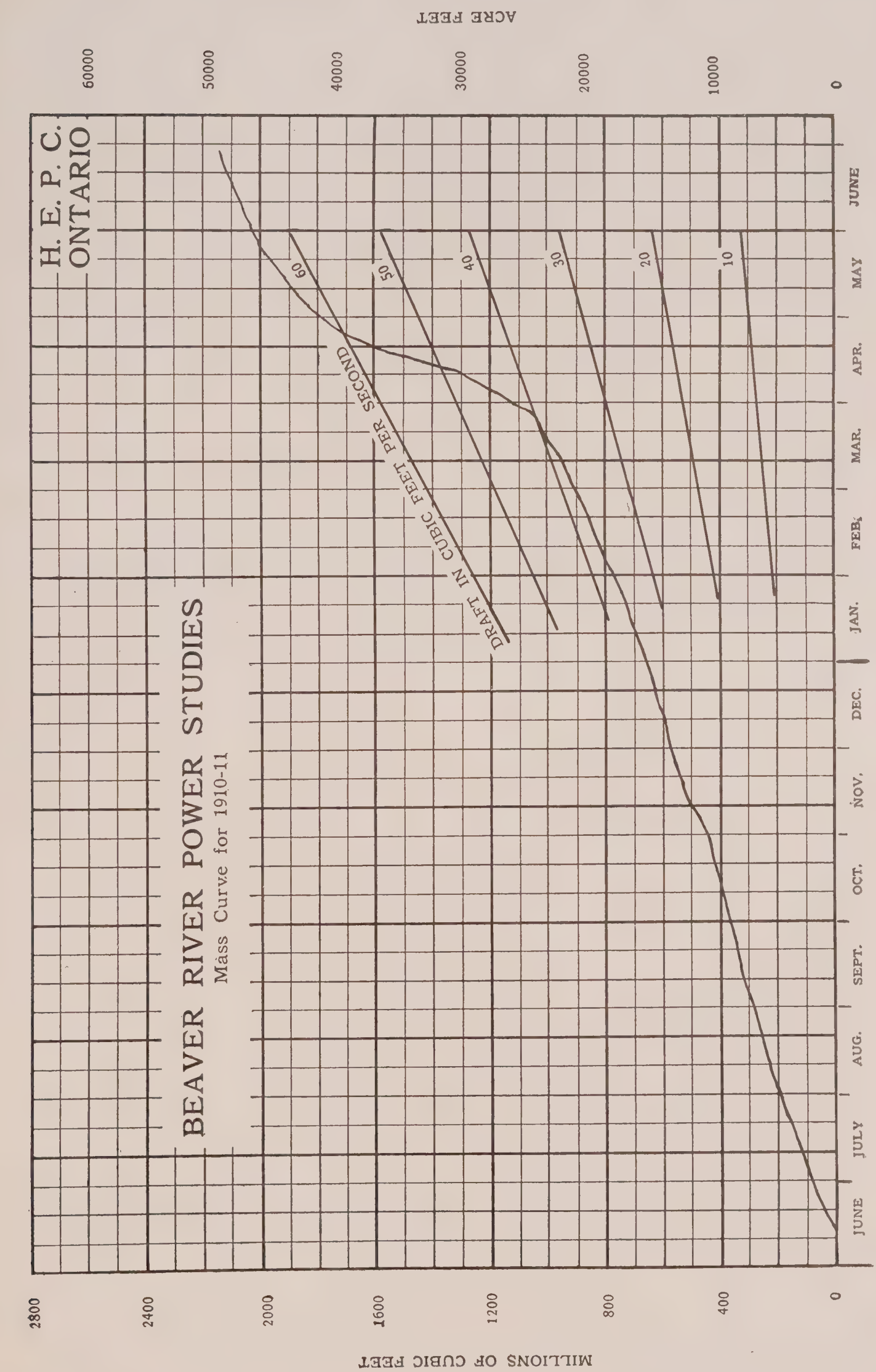
Monthly discharge of Beaver River at Eugenia for year 1913

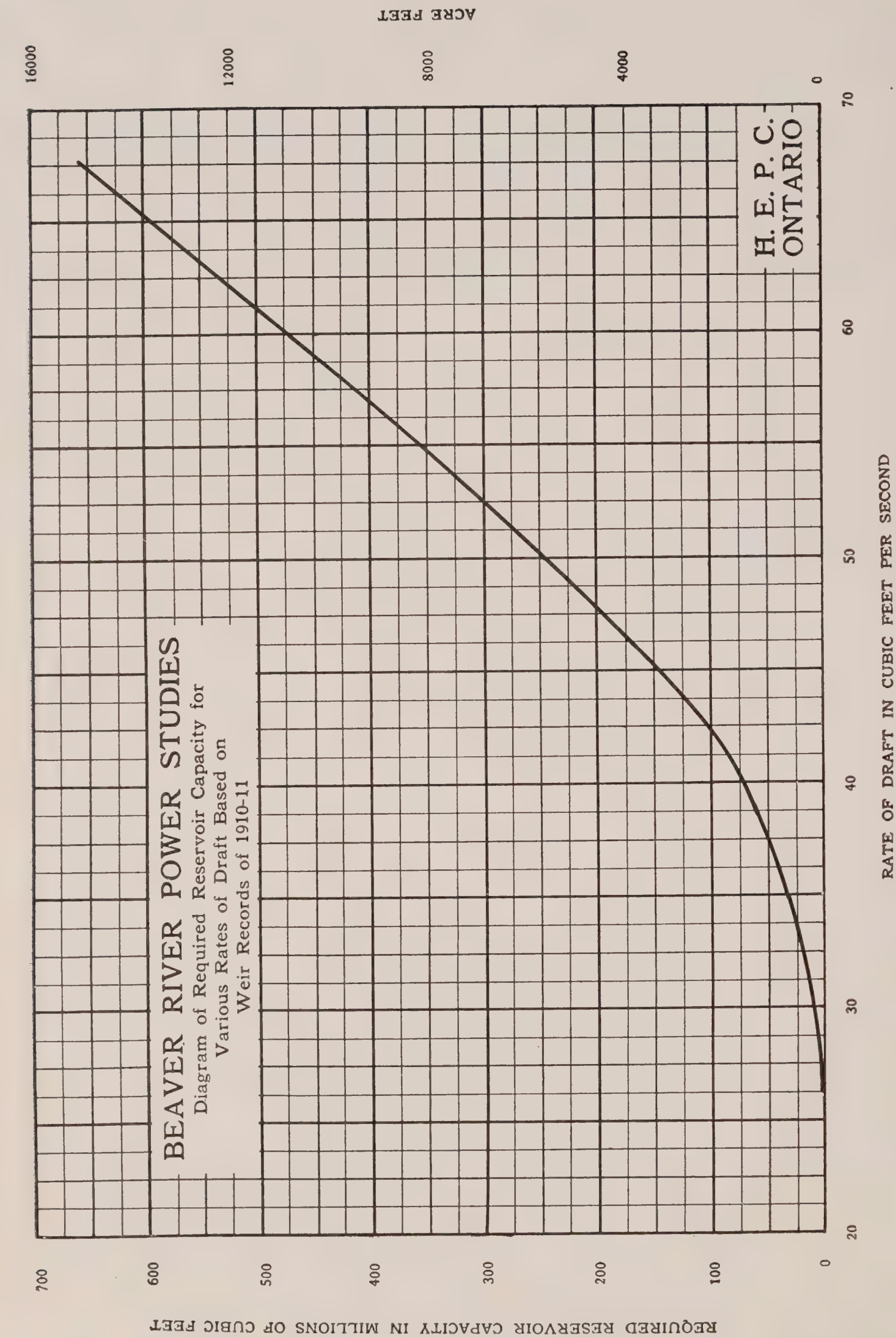
Drainage area, 74 square miles

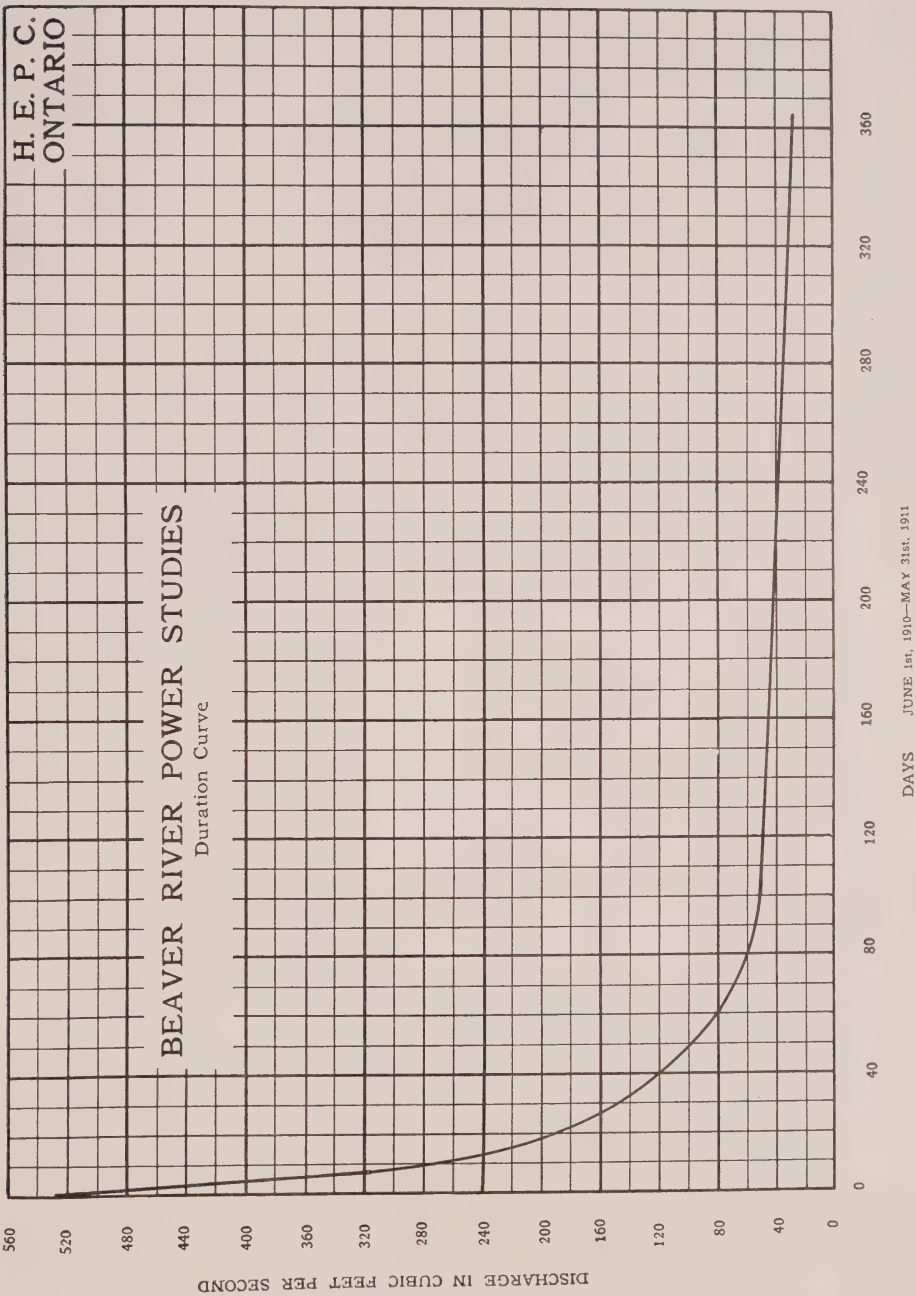
Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	99	50	66.4	1.34	.67	.90	1.00
July	57	35	43.5	.77	.47	.59	.68
August	36	29	32.6	.49	.39	.44	.51
September	31	25	28.5	.42	.34	.39	.43
October	44	27	30.0	.59	.36	.41	.47
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	99	25	40.20	1.34	.34	.55	3.09

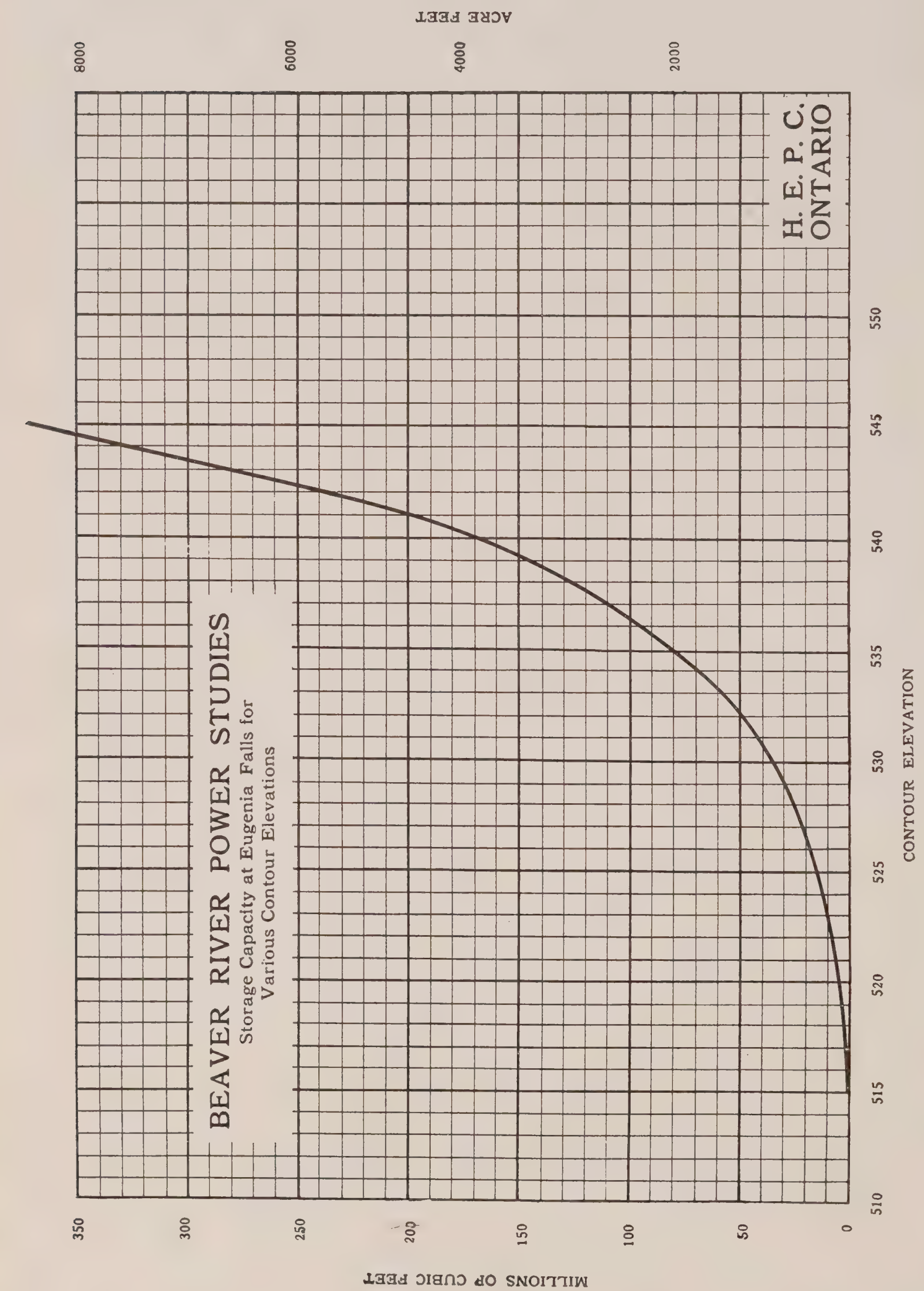

H. E. P. C.
ONTARIO
BEAVER RIVER
Hydrograph from July 1st 1910 to June 30th, 1911
AVERAGE FLOW FOR 12 MONTHS
DISCHARGE IN CUBIC FEET PER SECOND
0
100
200
300
400
500
600
700
JUNE 30
JULY 31
AUG. 31
SEPT. 30
OCT. 31
NOV. 30
DEC. 31
JAN. 31
FEB. 28
MAR. 31
APR. 30
MAY 31
JUNE 30
1910
1911

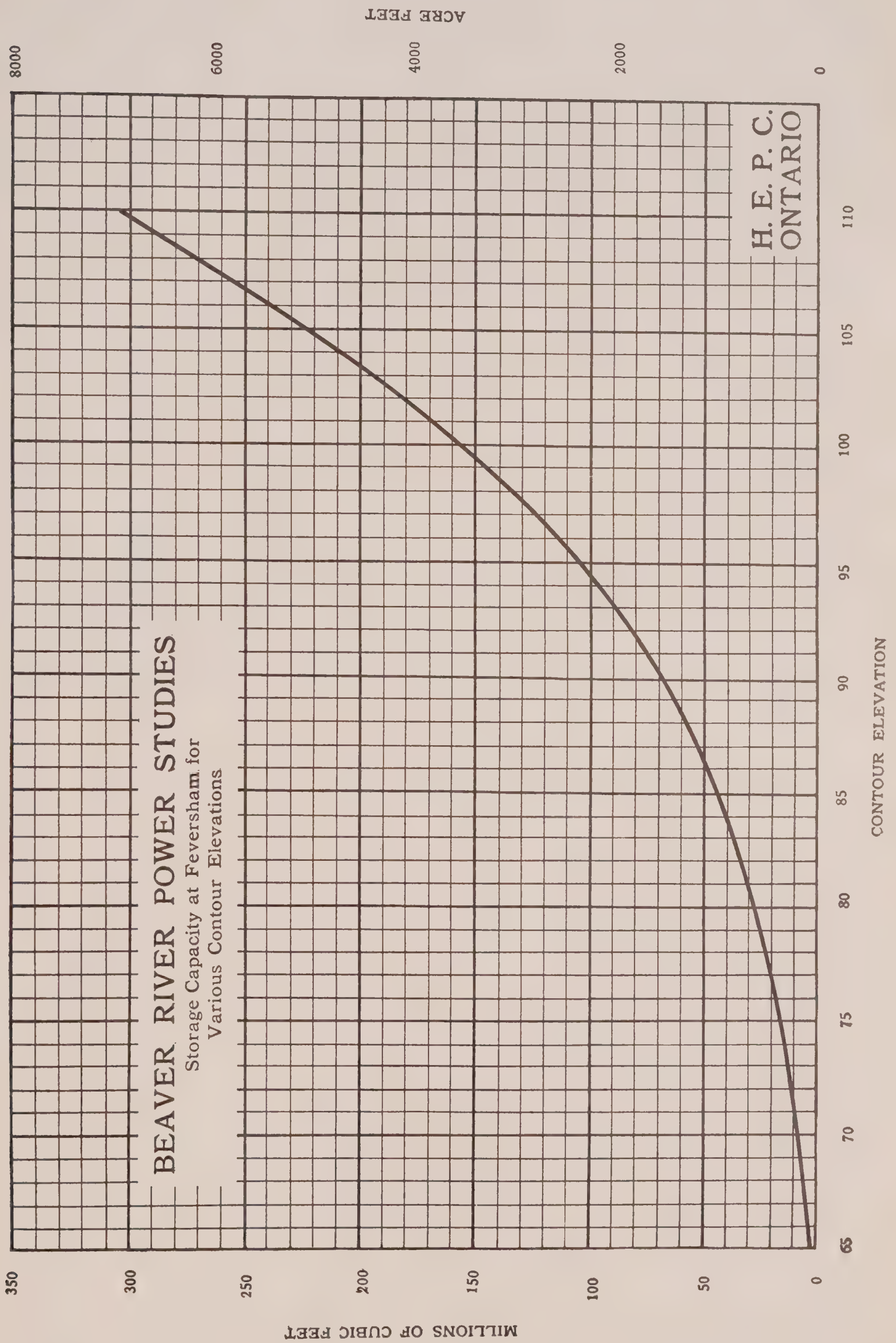

BEAVER RIVER POWER STUDIES
Weir Discharge Curve
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
0
20
40
60
80
100
120
140
160
180
200
GAUGE HEIGHT IN FEET
1.0
2.0
3.0

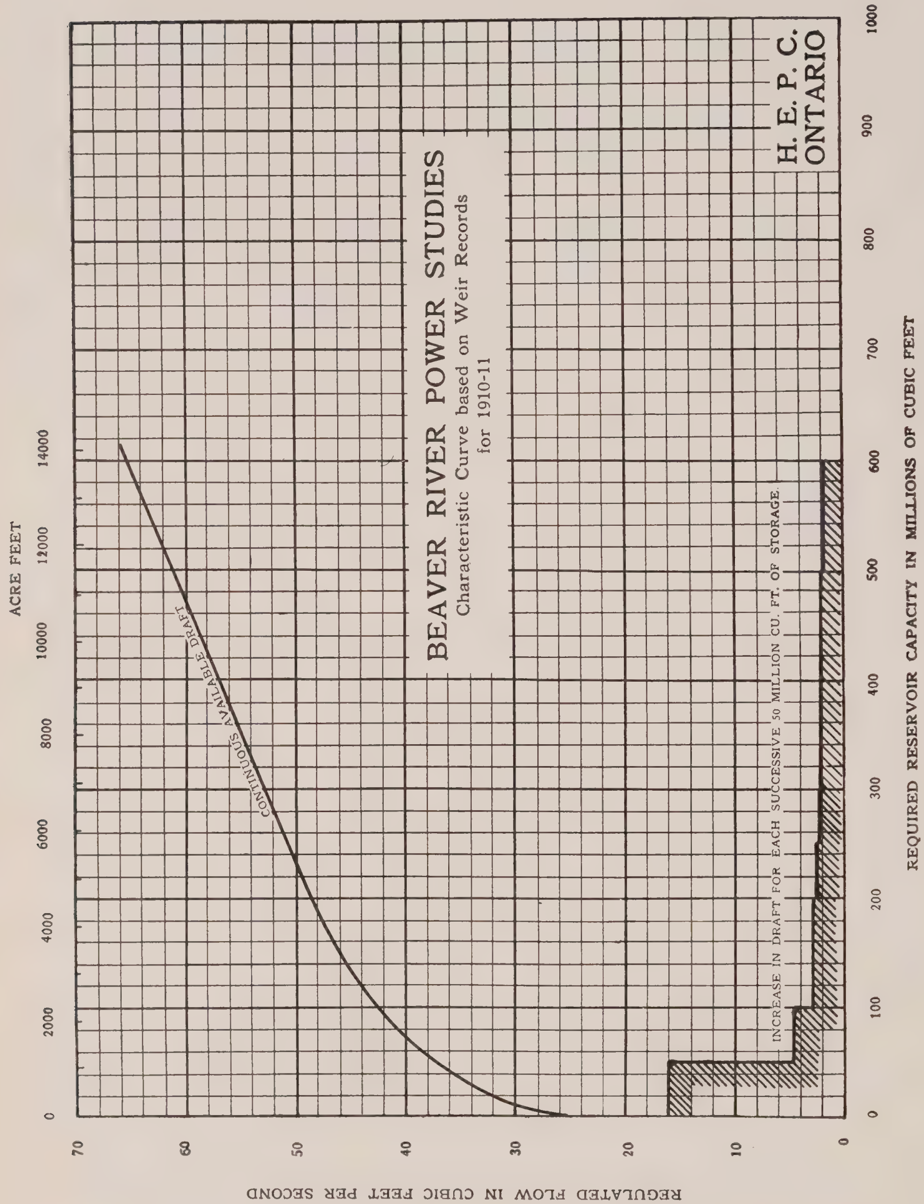

BEAVER RIVER POWER STUDIES
Mass Curve for 1910-11
H. E. P. C.
ONTARIO
DRAFT IN CUBIC FEET PER SECOND
10
20
30
40
50
60
ACRE FEET
0
10000
20000
30000
40000
50000
60000
MILLIONS OF CUBIC FEET
0
400
800
1200
1600
2000
2400
2800
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
1910
1911


BEAVER RIVER POWER STUDIES
Diagram of Required Reservoir Capacity for Various Rates of Draft Based on Weir Records of 1910-11
H. E. P. C. ONTARIO
RATE OF DRAFT IN CUBIC FEET PER SECOND
20
30
40
50
60
70
REQUIRED RESERVOIR CAPACITY IN MILLIONS OF CUBIC FEET
0
100
200
300
400
500
600
700
ACRE FEET
0
4000
8000
12000
16000


H. E. P. C.
ONTARIO
BEAVER RIVER POWER STUDIES
Duration Curve
DAYS
JUNE 1st, 1910—MAY 31st, 1911
0
40
80
120
160
200
240
280
320
360
DISCHARGE IN CUBIC FEET PER SECOND
0
40
80
120
160
200
240
280
320
360
400
440
480
520
560


BEAVER RIVER POWER STUDIES
Storage Capacity at Eugenia Falls for Various Contour Elevations
H. E. P. C. ONTARIO
ACRE FEET
8000
6000
4000
2000
MILLIONS OF CUBIC FEET
350
300
250
200
150
100
50
0
CONTOUR ELEVATION
510
515
520
525
530
535
540
545
550


BEAVER RIVER POWER STUDIES
Storage Capacity at Feversham for
Various Contour Elevations
H. E. P. C.
ONTARIO
ACRE FEET
8000
6000
4000
2000
0
MILLIONS OF CUBIC FEET
350
300
250
200
150
100
50
0
CONTOUR ELEVATION
65
70
75
80
85
90
95
100
105
110



BEAVER RIVER POWER STUDIES
Characteristic Curve based on Weir Records for 1910-11
H. E. P. C. ONTARIO
CONTINUOUS AVAILABLE DRAFT
INCREASE IN DRAFT FOR EACH SUCCESSIVE 50 MILLION CU. FT. OF STORAGE.
ACRE FEET
0 2000 4000 6000 8000 10000 12000 14000
REQUIRED RESERVOIR CAPACITY IN MILLIONS OF CUBIC FEET
0 100 200 300 400 500 600 700 800 900 1000
REGULATED FLOW IN CUBIC FEET PER SECOND
0 10 20 30 40 50 60 70

SAULT STE. MARIE

From time to time the Municipality of Sault Ste. Marie has applied for assistance in the matter of locating a suitable source of power for the requirements of the Municipality. Requests have been made at various times for reports as to the possibilities of obtaining the necessary power from the Mississaga, Chippawa and Montreal Rivers, but the quantities of power available from these different sources, and the very unfavorable conditions as regards transmission, have obviated the necessity of considering any of these propositions in detail, and the Municipality has been informed that the only source of power worth considering is the St. Mary's Rapids adjacent to the town.

Several years ago a report was made in connection with the possibility of developing power at White Fish Island, in the St. Mary's Rapids, but the conditions as regards riparian ownership and the division of water between Canada and the United States were not then sufficiently defined to permit the formulation of a definite scheme of development.

Under date of June 27th, 1913, the Michigan Lake Superior Power Co. applied to the International Joint Commission for the right to divert 25,000 sec. ft. of water from the St. Mary's River for power purposes. This brought the matter of division of flow at Sault Ste. Marie to an issue, and the conditions under which the Dominion of Canada will consent to the granting of the required permit to the Michigan Lake Superior Power Co. will involve the final settlement of the power question at Sault Ste. Marie.

The position of the Province in connection with this application is outlined in a statement forwarded to the International Joint Commission by Council on behalf of the Province of Ontario. The position taken by the Province as set forth in this response is as follows:—

1. The Province of Ontario, as the owner of the bed of the St. Mary's River and of the water power and waters thereof on the Canadian side of the International boundary, is interested in the matter of the application of the Michigan Lake Superior Power Co.

2. The Province of Ontario, by itself and its nominees, desires and intends to utilize one-half of the water of the St. Mary's River available, or which may become available for the development of power.

3. The Province of Ontario is content to consent to an Order of approval being made by the International Joint Commission in this matter in the form and on the conditions hereinafter stated:

(*a*) That the Order of approval shall define the term "Primary Water" as used in the application of the Michigan Lake Superior Power Co. as that portion of the outflow from Lake Superior which shall be considered as being continuously and permanently available for power purposes.

(*b*) That the Order of approval shall limit the amount of Primary Water to 60,000 cu. ft. per second, of which amount 30,000 cu. ft. per second shall be permanently available for use in Canada, and 30,000 cu. ft. per second permanently available for use in the United States.

(*c*) That before the application is disposed of an undertaking on behalf of the United States be filed with the International Joint Commission agreeing, in consideration of the Dominion of Canada and of the Province of Ontario consent-

ing to the approval hereinafter described being given by the International Joint Commission, that under no circumstances at any time hereafter will the United States itself use for power purposes, or allow the use for power purposes on the part of its Lessees or others, by diversion or any other means in either case, of an aggregate of more than 30,000 cu. ft. per second of Primary Water flowing out of Lake Superior by way of the natural channel of the St. Mary's River, or by way of any artificial race-ways, canals, or channels which may now or in the future exist in, along, or in the vicinity of, the St. Mary's Rapids.

The matter of this application will shortly come before the International Joint Commission for final disposal, and it is evident from the above that the conditions set forth as governing the consent of the Province of Ontario will allow definite action to be taken in the matter of formulating a scheme for the supply of power to the Municipality of Sault Ste. Marie.

MAITLAND RIVER

A report on the power possibilities of the Maitland River was given in the Fifth Annual Report. Since the preparation of that report, continuous daily gauge readings have been made at Benmiller, and these readings, with the aid of a rating curve of the stream, compiled from the regular monthly measurement of discharge, have furnished the data for a further study of the hydrology of the river in its relation to the development of power.

The appended duration curves plotted for the years 1911, 1912 and 1913, indicate that the amount of flow for economical development on this river ranges from 300 cu. ft. per second on the 212½ ordinate to 1,000 cu. ft. per second on the 152½ ordinate. (For an explanation of the Duration Curve and the Mass Curve, see report on the Beaver River.)

In last year's report the abnormal flow characteristics of the Maitland River were noted, and attention was drawn to the fact that any development of power must depend for continuous operation on the minimum flow of the stream in conjunction with such advantages as can be derived from local pondage.

During the summer of 1913, on a number of days the minimum flow of the stream was 75 cu. ft. per second. At the Black Hole site, with an operating head of 80 ft., this flow, without pondage, gives a minimum continuous power capacity of about 545 h.p. The local pondage above the Black Hole dam would be something over 700 acres. Assuming a maximum draw on this pond of 5 ft. (thus giving a minimum operating head of 75 ft.), a reservoir capacity of 3,500 acre feet would be avaiable.

An analysis of the mass curve of the Maitland River from 1911 to date, shows that 3,500 acre feet of reservoir capacity will provide a continuous discharge of about 110 cu. ft. per second. In extremely dry years it is probable this flow would not exceed 100 cu. ft. per second.

From the above fact, it is safe to say that any power development on the Maitland River at the Black Hole site could not be depended upon to deliver continuously more than 750 h.p.

The following table gives the amount of storage required for different rates of uniform draft up to 200 cu. ft. per second, with the continuous available power for these amounts, if developed at the Black Hole:

Required Storage in Million cu. ft.	Storage in Acre feet	Uniform Flow in cu. ft. per sec.	Continuous Power Available
0	0	75	545 h.p.
80	1,835	100	725 "
260	5,960	125	910 "
520	11,920	150	1,090 "
800	18,350	175	1,270 "
1,100	25,230	200	1,450 "

The above table shows that for the development of 1,500 h.p. of continuous power at the Black Hole about 25,000 acre-feet of storage will be required. Owing to the fact that facilities for storage in the Maitland River watershed are lacking to an unusual degree, the purchase of land construction of the necessary works would entail an expenditure which, added to abnormal cost of development at the Black Hole, places the project, for the time being, outside of economic limits as a source of continuous power.

Daily Gauge Height and Discharge of Maitland River, at Benmiller, for 1911

Drainage area, 950 square miles

Day	January		February		March		April		May		June		July		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	....	....	....	....	....	....	....	....	....	....	13.63	355	13.30	140	13.34	155	13.22	115	13.72	450	13.93	700	15.26	3525
2	....	....	....	....	....	....	....	....	....	....	13.59	325	13.26	125	13.32	150	13.22	115	13.80	525	13.97	800	15.05	2950
3	....	....	....	....	....	....	....	....	....	....	13.72	450	13.32	115	13.30	140	13.22	115	13.80	525	14.01	850	14.76	2225
4	....	....	....	....	....	....	....	....	....	....	13.63	355	13.20	110	13.55	285	13.22	115	13.80	525	13.97	800	14.38	1380
5	....	....	....	....	....	....	....	....	....	....	13.72	450	13.18	105	13.55	285	13.22	115	13.76	500	14.01	850	14.30	1235
6	....	....	....	....	....	....	....	....	....	....	13.63	355	13.30	140	13.38	175	13.30	140	13.76	500	14.01	850	14.38	1380
7	....	....	....	....	....	....	....	....	....	....	13.59	325	13.43	205	13.38	175	13.30	140	13.72	450	14.30	1230	14.30	1235
8	....	....	....	....	....	....	....	....	....	....	13.61	335	13.36	165	13.43	205	13.34	155	13.68	400	14.55	1750	14.38	1380
9	....	....	....	....	....	....	....	....	....	....	13.63	355	13.38	175	13.38	175	13.34	155	13.63	355	15.05	2950	14.88	2550
10	....	....	....	....	....	....	....	....	....	....	13.61	335	13.38	175	13.38	175	13.34	155	13.63	355	14.88	2550	15.22	3400
11	....	....	....	....	....	....	....	....	....	....	13.61	335	13.30	140	13.38	175	13.34	155	13.68	400	14.88	2550	15.72	4950
12	....	....	....	....	....	....	....	....	....	....	13.63	355	13.26	125	13.38	175	13.43	205	13.72	450	15.05	2950	15.68	4900
13	....	....	....	....	....	....	....	....	....	....	13.76	500	13.24	120	13.38	175	13.47	225	13.63	355	15.05	2950	15.59	4550
14	....	....	....	....	....	....	....	....	....	....	13.80	525	13.22	115	13.34	155	13.47	225	13.59	325	14.97	2800	15.22	3400
15	....	....	....	....	....	....	....	....	....	....	13.84	570	13.20	110	13.30	140	13.47	225	13.55	285	14.88	2550	14.97	2800
16	....	....	....	....	....	....	....	....	....	....	13.76	500	13.22	115	13.34	155	13.43	205	13.55	285	14.76	2225	14.76	2225
17	....	....	....	....	....	....	....	....	....	....	13.76	450	13.47	225	13.43	205	13.43	205	13.55	285	14.72	2150	14.63	1950
18	....	....	....	....	....	....	....	....	....	....	13.63	355	13.53	270	13.38	175	13.38	175	13.23	355	15.22	3400	14.51	1650
19	....	....	....	....	....	....	....	....	....	....	13.50	245	13.40	185	13.34	155	13.38	175	13.76	500	15.26	3525	14.47	1600
20	....	....	....	....	....	....	....	....	....	....	13.47	225	13.59	325	13.30	140	13.34	155	13.18	615	15.30	3550	14.38	1380
21	....	....	....	....	....	....	....	....	....	....	13.43	205	13.43	205	13.26	125	13.34	155	13.80	525	15.26	3525	14.13	1000
22	....	....	....	....	....	....	....	....	....	....	13.38	175	13.36	165	13.26	125	13.34	155	13.93	685	15.22	3400	14.30	1300
23	....	....	....	....	....	....	....	....	....	....	13.38	175	13.30	140	13.24	120	13.38	175	14.22	1100	15.13	3200	14.47	1600
24	....	....	....	....	....	....	....	....	....	....	13.38	175	13.38	175	13.24	120	13.38	175	14.47	1600	15.01	2900	14.55	1750
25	....	....	....	....	....	....	....	....	....	....	13.38	175	13.38	175	13.26	125	13.38	175	14.43	1500	14.93	2675	14.47	1600
26	....	....	....	....	....	....	....	....	....	....	13.38	175	13.43	205	13.30	140	13.38	175	14.34	1350	14.76	2225	14.43	1500
27	....	....	....	....	....	....	....	....	....	....	13.36	165	13.43	205	13.30	140	13.47	225	14.22	1150	14.68	2050	14.38	1380
28	....	....	....	....	....	....	....	....	....	....	13.36	165	13.38	175	13.30	140	13.55	285	14.04	925	15.05	2950	14.26	1225
29	....	....	....	....	....	....	....	....	....	....	13.34	155	13.30	140	13.22	115	13.55	285	14.01	850	15.55	4425	14.18	1100
30	....	....	....	....	....	....	....	....	....	....	13.32	150	13.38	175	13.18	105	13.63	355	13.97	800	15.51	4300	14.18	1100
31	....	....	....	....	....	....	....	....	....	....	....	....	13.38	175	13.22	115	....	....	13.93	700	....	....	14.97	2800

Daily Gauge Height and Discharge of Maitland River, at Benmiller, for 1912

Drainage area, 950 square miles

Day	January Gauge Ht.	January Discharge	February Gauge Ht.	February Discharge	March Gauge Ht.	March Discharge	April Gauge Ht.	April Discharge	May Gauge Ht.	May Discharge	June Gauge Ht.	June Discharge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	14.68	2050	......	.....	......	4900	16.47	8875	13.88	620	14.93	2820
2	14.73	2250	......	.....	......	4900	16.72	9950	13.72	440	14.63	1990
3	14.72	2150	......	.....	15.47	4600	16.55	9200	13.76	480	14.63	1990
4	14.84	2550	......	.....	15.47	4600	16.55	9200	13.84	570	15.22	3700
5	14.13	1020	......	.....	15.38	4300	16.63	9600	13.80	525	15.13	3400
6	14.47	1570	......	.....	15.30	3950	20.26	41600	13.84	570	14.80	2450
7	15.80	5000	......	.....	15.22	3700	21.60	65000	13.70	525	14.55	1800
8	16.22	7800	......	.....	15.13	3400	20.22	41100	13.84	570	14.47	1570
9	16.22	7800	......	.....	15.09	3300	17.88	15000	13.84	570	14.30	1230
10	16.13	7450	......	.....	15.09	3300	17.05	11400	13.80	525	14.13	965
11	16.09	7275	......	.....	15.05	3175	16.55	9200	13.76	480	13.97	740
12	16.01	6900	......	.....	15.05	3175	16.05	7000	13.80	525	13.97	740
13	15.97	6750	......	.....	15.05	3175	15.80	6000	13.88	620	13.88	620
14	15.97	6750	......	.....	14.97	2950	15.53	4950	14.13	965	13.84	570
15	15.88	6375	......	.....	14.97	2950	15.72	5650	14.63	1990	13.80	525
16	15.84	6175	......	.....	14.97	2950	15.63	5275	14.55	1800	13.80	525
17	15.80	6000	......	.....	14.97	2950	15.46	4600	14.55	1800	13.76	480
18	15.80	6000	......	.....	14.80	2450	15.30	3950	14.63	1990	13.72	440
19	15.76	5825	......	.....	14.88	2680	15.18	3575	14.89	2690	13.68	400
20	15.84	6175	......	.....	14.97	2950	15.01	3050	15.30	3950	13.68	400
21	15.88	6375	......	.....	14.80	2450	14.76	2490	16.13	7450	13.59	325
22	15.88	6375	......	.....	15.38	4300	14.68	2100	17.38	12800	13.55	285
23	15.84	6175	......	.....	15.38	4300	14.55	1800	17.30	12400	13.51	255
24	15.84	6175	......	.....	15.47	4600	14.47	1570	16.97	11000	13.47	225
25	15.84	6175	......	.....	15.47	4600	14.42	1465	16.63	9600	13.43	205
26	15.84	6175	......	.....	15.51	4775	14.38	1380	16.05	7000	13.47	225
27	......	6000	......	.....	15.59	5100	14.22	1100	15.80	6000	13.47	225
28	......	6000	......	.....	15.59	5100	14.18	1040	15.63	5275	13.47	225
29	......	5700	......	.....	15.63	5275	14.05	785	15.30	3950	13.46	220
30	......	5500	......	.....	15.88	6375	13.97	740	16.13	7450	13.43	205
31	......	5100	......	.....	16.30	8150	......	.....	15.38	4300	......	.....

Day	July Gauge Ht.	July Discharge	August Gauge Ht.	August Discharge	September Gauge Ht.	September Discharge	October Gauge Ht.	October Discharge	November Gauge Ht.	November Discharge	December Gauge Ht.	December Discharge
	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.	Feet	Sec-ft.
1	13.43	205	13.43	205	15.13	3400	14.47	1570	14.47	1570	14.39	1425
2	13.39	180	13.39	180	15.97	6750	14.51	1665	15.05	3175	14.72	2250
3	13.39	180	13.47	225	15.80	6000	14.47	1570	15.30	3950	15.22	3700
4	13.39	180	13.43	205	15.38	4300	14.34	1310	15.39	4350	16.05	7000
5	13.34	165	13.39	180	14.97	2950	14.13	1020	15.22	3700	15.63	5275
6	13.34	165	13.39	180	14.63	1990	14.09	905	15.26	3900	15.68	5500
7	13.34	165	13.34	165	14.38	1380	14.05	850	16.40	8600	15.47	4600
8	13.30	140	13.39	180	14.22	1100	13.97	740	16.30	8150	15.22	3700
9	13.39	180	13.43	205	14.09	905	13.88	620	16.13	7450	14.76	2490
10	13.39	180	13.43	205	13.97	740	14.01	785	14.88	2680	13.72	440
11	13.39	180	13.47	335	13.88	620	14.13	1020	15.55	4950	13.97	740
12	13.34	165	13.55	285	13.80	525	14.30	1230	15.30	3950	14.09	905
13	13.34	165	13.72	440	13.72	440	14.34	1310	15.47	4600	14.13	965
14	13.34	165	13.63	355	13.72	440	14.30	1230	16.80	10300	14.43	1485
15	13.34	165	13.55	285	13.80	525	14.26	1165	16.22	7800	14.59	1885
16	13.39	180	13.47	325	14.01	785	14.09	905	15.76	5825	14.72	2250
17	13.39	180	13.43	205	14.13	965	14.01	785	15.39	4350	14.63	1990
18	13.34	165	13.51	255	14.22	1100	13.97	740	15.13	3400	14.51	1660
19	13.30	140	13.47	225	14.30	1230	14.13	1020	14.97	2950	14.43	1485
20	13.30	140	13.47	225	14.42	1465	14.51	1660	14.82	2500	14.30	1230
21	13.47	225	13.80	525	14.47	1570	14.42	1465	14.72	2250	14.26	1165
22	13.63	355	13.88	620	14.42	1465	14.30	1230	14.68	2100	14.17	1025
23	13.63	355	14.01	785	14.47	1570	14.30	1230	15.49	4690	14.13	965
24	13.76	480	14.01	785	14.38	1380	14.26	1165	14.47	1570	14.05	850
25	13.76	480	14.09	905	14.34	1310	14.18	1040	14.47	1570	14.09	905
26	13.72	440	14.13	965	14.34	1210	14.09	905	14.43	1485	14.09	905
27	13.63	355	13.97	740	14.38	1380	14.09	905	14.41	1445	13.97	740
28	13.51	255	13.88	620	14.38	1380	14.05	850	14.39	1425	13.97	740
29	13.43	205	13.84	570	14.42	1465	13.99	765	14.34	1310	13.97	740
30	13.34	165	13.80	525	14.47	1570	13.97	740	14.30	1230	13.93	680
31	13.43	205	13.72	440	......	.....	13.93	680	......	.....	13.89	635

Daliy Gauge Height and Discharge of Maitland River, at Benmiller, for 1913

Drainage area, 950 square miles

Day	January		February		March		April		May		June		July'		August		September		October		November		December	
	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge	Gauge Ht.	Dis-charge
	Feet	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*	*Feet*	*Sec-ft.*
1	13.93	680	14.80	2450	14.55	1880	16.55	9200	14.05	785	13.45	215	13.30	140	13.05	80	13.09	90	13.05	80	......	.....	......	.....
2	14.05	785	14.63	1990	14.47	1570	15.23	5275	13.97	740	13.45	215	13.28	130	13.05	80	63.09	30	13.05	80	......	.....	......	.....
3	14.05	785	14.53	1800	14.30	1230	15.32	6500	13.89	630	13.45	215	13.24	120	13.11	90	13.05	80	13.09	90	......	.....	......	.....
4	14.01	800	14.47	1570	14.22	1100	17.72	14200	13.76	480	13.43	205	13.30	140	13.05	80	13.05	80	13.09	90	......	.....	......	.....
5	13.92	670	14.39	1425	14.13	965	17.34	12600	13.72	440	13.43	205	13.30	140	13.03	75	13.05	80	13.11	90	......	.....	......	.....
6	14.18	1040	14.34	1310	13.97	740	16.30	8150	13.72	440	13.37	175	13.30	140	13.03	75	13.05	80	13.11	90	......	.....	......	.....
7	14.22	1100	14.30	1230	13.84	570	15.59	5100	13.68	400	13.37	175	13.26	125	13.03	75	13.05	80	13.09	90	......	.....	......	.....
8	14.30	1230	14.30	1230	13.72	440	15.22	3700	13.64	360	13.37	175	13.22	115	13.03	75	13.05	80	13.01	70	......	.....	......	.....
9	14.43	1485	14.30	1230	13.97	740	15.05	3175	13.64	360	13.37	175	13.22	115	13.24	120	13.05	80	12.97	90	......	.....	......	.....
10	14.47	1570	14.30	1230	14.30	1230	15.30	3950	13.60	330	13.34	165	13.22	115	13.42	195	13.05	80	12.97	70	......	.....	......	.....
11	14.55	1880	14.30	1230	14.55	1880	16.55	9280	13.55	285	13.34	165	13.13	95	13.42	195	13.05	80	13.26	125	......	.....	......	.....
12	14.77	2200	14.26	1165	14.84	570	16.38	8500	13.55	285	13.34	165	13.20	110	13.17	100	13.09	90	13.34	155	......	.....	......	.....
13	14.41	1445	14.22	1100	15.30	3950	16.13	7450	13.59	325	13.34	165	13.26	125	13.17	100	13.09	90	13.30	140	......	.....	......	.....
14	14.39	1425	14.14	980	17.18	11950	15.55	4950	13.58	325	13.34	165	13.24	120	13.15	100	13.09	90	13.17	100	......	.....	......	.....
15	14.39	1425	14.14	980	19.72	34200	14.93	2820	13.59	325	13.32	150	13.07	85	13.13	95	12.97	70	13.17	100	......	.....	......	.....
16	15.47	4600	14.14	980	17.80	14550	14.72	2250	13.59	325	13.26	125	13.07	85	13.13	95	13.05	80	13.13	95	......	.....	......	.....
17	17.05	11400	14.09	905	16.97	11000	14.55	1880	13.59	325	13.26	125	13.07	85	13.09	95	13.09	90	13.22	115	......	.....	......	.....
18	17.22	12100	14.05	850	16.30	8150	14.38	1380	13.59	325	13.22	115	13.07	85	13.13	95	13.09	90	13.30	140	......	.....	......	.....
19	16.89	10700	14.22	1100	15.80	6000	14.30	1230	13.64	360	13.34	115	13.18	105	13.05	80	13.09	90	13.34	155	......	.....	......	.....
20	16.72	9950	14.47	1570	16.22	7800	14.22	1100	13.64	360	13.37	175	13.17	100	13.13	95	13.17	100	13.34	155	......	.....	......	.....
21	16.72	9950	14.47	1570	16.47	8875	14.13	365	13.64	360	13.34	165	13.13	95	13.15	100	13.17	100	13.38	175	......	.....	......	.....
22	16.55	9200	14.66	2025	16.34	8325	14.09	905	13.64	360	13.30	140	13.13	95	13.13	95	13.13	95	13.42	195	......	.....	......	.....
23	16.34	8350	15.38	4300	16.55	9200	14.13	965	13.59	325	13.30	140	13.13	95	13.13	95	13.09	90	13.51	255	......	.....	......	.....
24	16.13	7450	15.01	3050	15.11	3200	14.09	905	13.59	325	13.32	150	13.13	95	13.15	100	13.07	85	13.80	525	......	.....	......	.....
25	15.76	5825	15.01	3050	18.05	16700	14.09	905	13.55	285	13.32	150	13.11	90	13.15	100	13.17	100	13.80	525	......	.....	......	.....
26	15.55	4950	14.89	2690	17.47	13500	14.13	965	13.55	285	13.30	140	13.11	90	13.13	95	13.13	95	13.74	460	......	.....	......	.....
27	15.30	3950	14.80	2450	16.30	8150	14.22	1100	13.55	285	13.32	150	13.11	90	13.13	95	13.13	95	13.66	380	......	.....	......	.....
28	15.09	3300	14.68	2100	16.05	7100	14.22	1100	13.57	300	13.32	150	13.11	90	13.13	95	13.11	90	13.59	320	......	.....	......	.....
29	14.84	2550	......	.....	15.92	6500	14.18	1040	13.51	255	13.30	140	13.09	90	13.11	90	12.99	70	13.63	355	......	.....	......	.....
30	14.72	2250	......	.....	15.80	6000	14.09	905	13.47	225	13 32	150	13.09	90	13.11	90	13.05	80	13.63	355	......	.....	......	.....
31	14.97	2950	......	.....	16.05	7100	......	.....	13.47	225	......	.....	13.09	90	13.11	90	......	.....	13.63	355	......	.....	......	.....

Monthly discharge of Maitland River at Benmiller for year 1911

Drainage area, 950 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per spuare mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	570	150	314	.60	.16	.33	.37
July	325	105	165	.34	.11	.17	.20
August	285	105	159	.30	.11	.17	.20
September	355	115	181	.37	.12	.19	.21
October	1,600	285	634	1.68	.30	.67	.76
November	4,425	700	2,455	4.67	.74	2.58	2.88
December	4.950	1,000	2,161	5.21	1.05	2.28	2.63
The period	4,950	105	867	5.21	.11	.91	7.25

Monthly discharge of Maitland River at Benmiller for year 1912

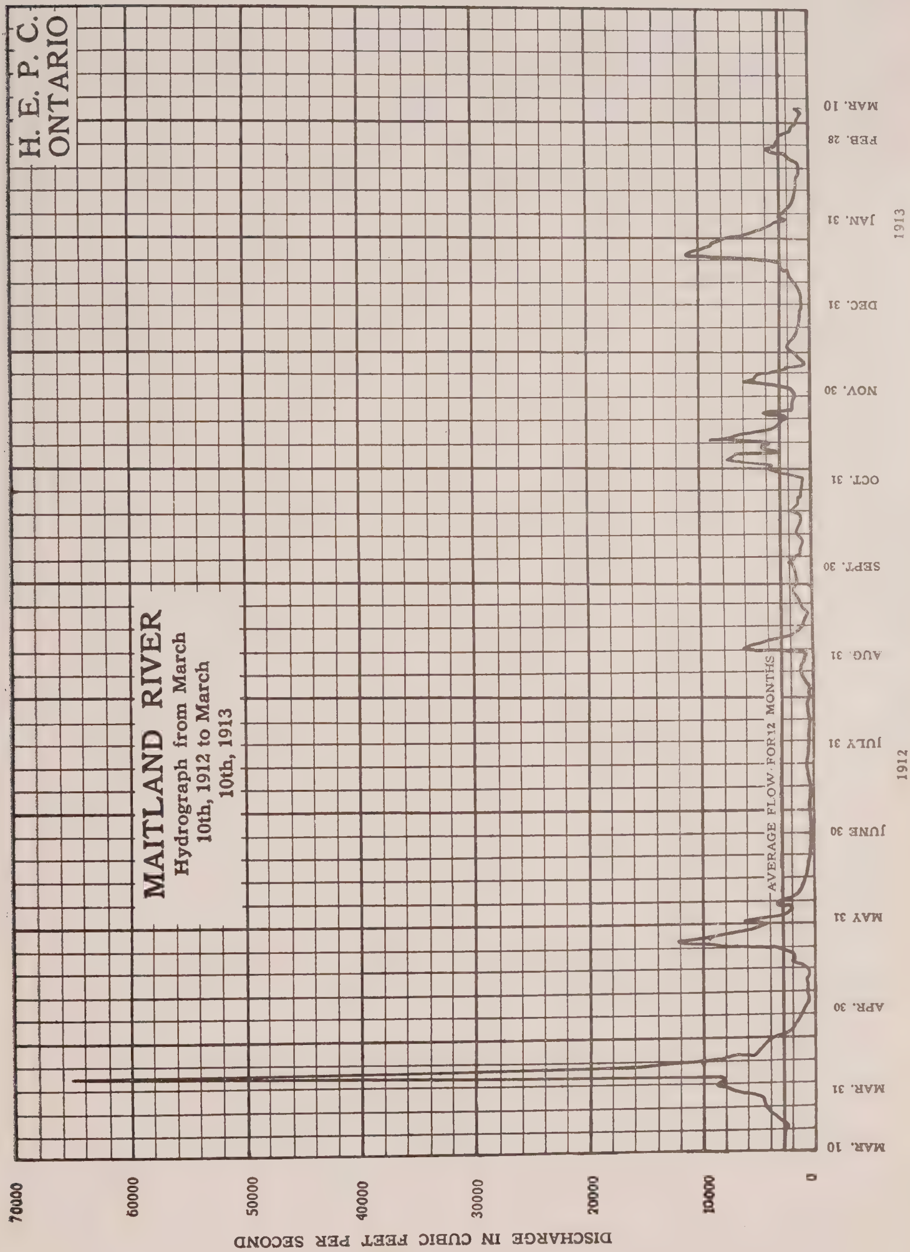
Drainage area, 950 square miles

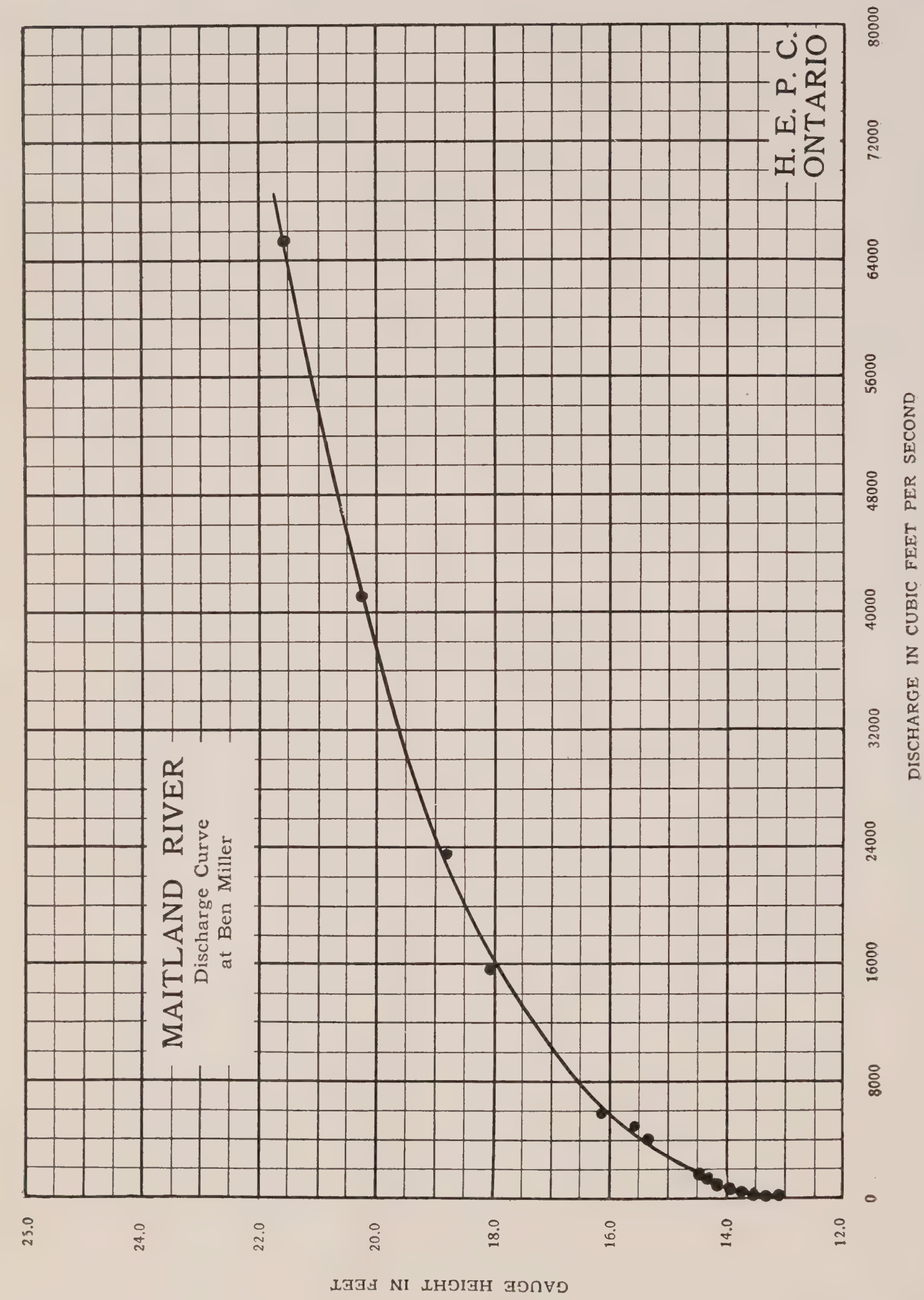
Month.	Discharge in second-feet.			Discharge in second-feet per square mile.			Run-off.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	7,800	1,020	5,500	8.22	1.07	5.80	6.68
February	....	....	....	....	....	....	....
March	8,150	2,450	4,040	8.58	2.58	4.25	4.90
April	65,000	740	9,630	68.45	0.78	10.10	11.27
May	12,800	440	3,530	13.47	0.46	3.72	4.29
June	3,700	205	992	3.89	0.22	1.04	1.16
July	480	140	222	0.50	0.15	0.23	.27
August	965	165	392	1.01	0.17	0.41	.47
September	6,750	440	1,732	7.10	0.46	1.82	2.03
October	1,665	620	1,066	1.75	0.65	1.12	1.29
November	10.300	1.230	3.910	10.82	1.29	4.12	4.60
December	7.000	440	1,945	7.37	0.46	2.04	2.35
The period	65,000	140	2,996	68.45	0.15	3.15	39.31

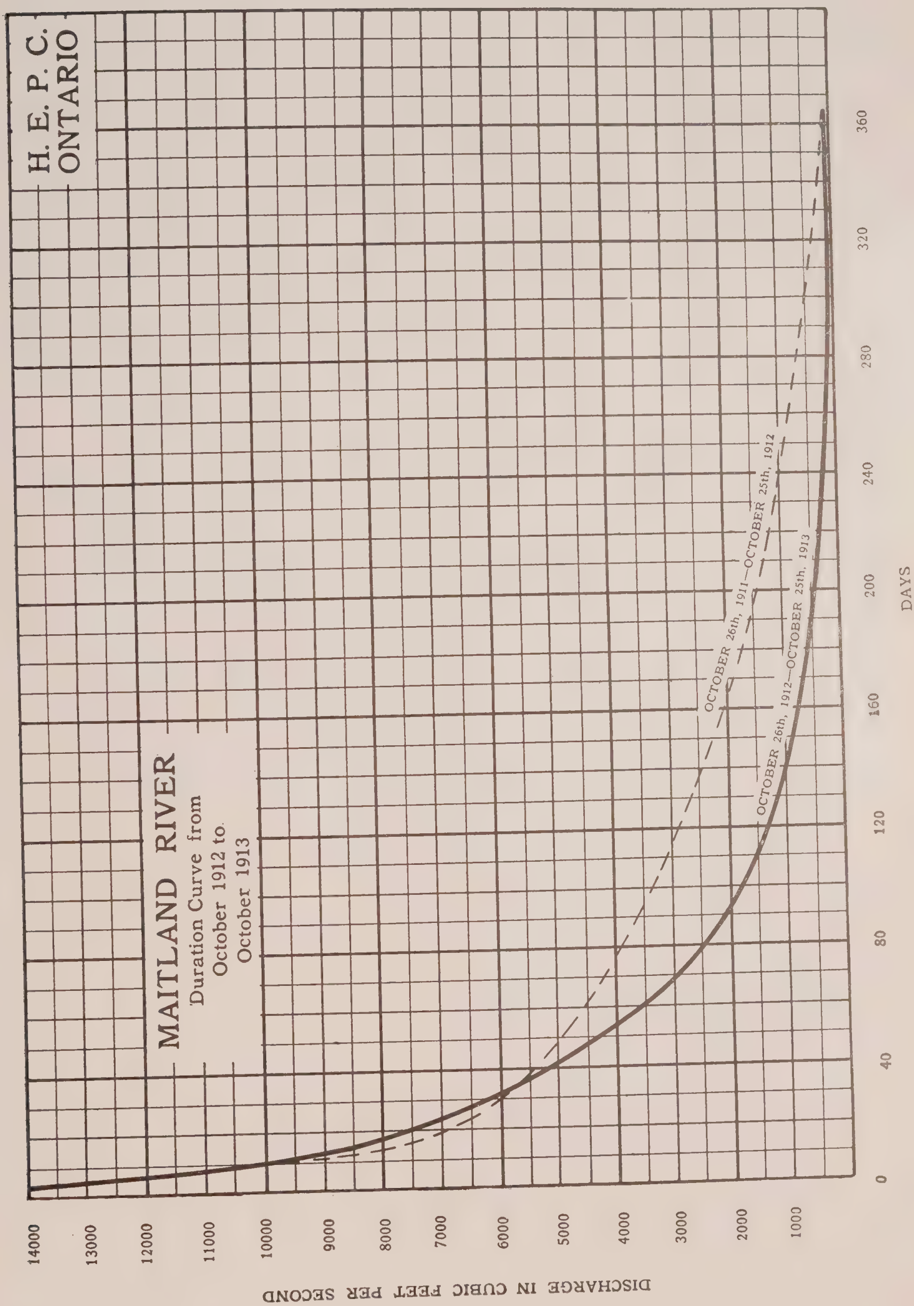
Monthly discharge of Maitland River at Benmiller for year 1913

Drainage area, 950 square miles

Month.	Discharge in second-feet.			Discharge in second-feet per square mile			Run-off
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Depth in inches on drainage area.
January	12,100	670	4,125	12.72	.70	4.34	5.00
February	4,300	850	1,700	4.52	.89	1.79	1.86
March	34,200	440	6,620	35.95	.46	6.97	8.05
April	14,200	905	4,075	14.94	.95	4.29	4.79
May	785	225	369	0.83	.24	0.39	0.45
June	215	115	162	0.23	.12	0.17	0.19
July	140	85	106	0.15	.09	0.11	0.13
August	195	75	98	0.21	.08	0.10	0.12
September	100	70	86	0.11	.07	0.09	0.10
October	525	70	193	0.55	.07	0.20	0.23
November	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....
The period	34,200	70	1,753	35.95	.07	1.85	20.92


H. E. P. C.
ONTARIO
MAITLAND RIVER
Hydrograph from March 10th, 1912 to March 10th, 1913
AVERAGE FLOW FOR 12 MONTHS
MAR. 10
MAR. 31
APR. 30
MAY 31
JUNE 30
JULY 31
AUG. 31
SEPT. 30
OCT. 31
NOV. 30
DEC. 31
JAN. 31
FEB. 28
MAR. 10
1912
1913
70000
60000
50000
40000
30000
20000
10000
0
DISCHARGE IN CUBIC FEET PER SECOND


MAITLAND RIVER
Discharge Curve
at Ben Miller
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
0
8000
16000
24000
32000
40000
48000
56000
64000
72000
80000
GAUGE HEIGHT IN FEET
12.0
14.0
16.0
18.0
20.0
22.0
24.0
25.0


H. E. P. C.
ONTARIO
MAITLAND RIVER
Duration Curve from
October 1912 to
October 1913
OCTOBER 26th, 1911—OCTOBER 25th, 1912
OCTOBER 26th, 1912—OCTOBER 25th, 1913
DISCHARGE IN CUBIC FEET PER SECOND
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
DAYS
0
40
80
120
160
200
240
280
320
360

HYDROGRAPHIC SURVEYS

The stream measurement work developed in 1912 has been carried on continuously up to the present time with satisfactory results in the case of some rivers, and the reverse in others, as the appended tabular data will indicate. The relation between gauge height and discharge was disturbed in nearly every case by ice conditions, as was to be expected. In the case of the rivers in the southwestern peninsula, such as the Grand, Maitland, Saugeen, Thames, Credit, and Nottawasaga, measurable velocities could in general only be obtained at wide shallow sections, where a high degree of accuracy in measurement could not be depended upon. The large number of mill-dams located in these streams also made it impossible to locate all gauges where they would not be affected by back-water at high stages of flow. As mentioned elsewhere, this trouble has not yet manifested itself at the stations established on the Grand River during 1913, but it is to be expected during periods of high water.

In the case of the northern rivers, the above conditions were aggravated in many instances by the necessity of locating stations at accessible points. This usually meant the use of a bridge station, and in the case of the Sturgeon, Maganetawan, Wahnapitae, Spanish and Seguin Rivers, backwater trouble occurs intermittently owing to the operation of dams in connection with power development. The Mississaga station is seriously affected by wind levels on Lake Huron.

In the case of the Thames, Saugeen, South, Sturgeon and Credit rivers it has been found that by eliminating measurements where backwater effects are plainly evident, a fairly good station rating curve is obtainable. These curves are appended hereto, along with others which may be accepted without explanation. An effort will be made to re-locate the gauges at some of these stations so as to produce better results, but in most cases the location of stations altogether beyond the influence of backwater would entail the use of camping outfits for purposes of measurement and others items involving an expense which may not prove justifiable.

In May, 1913, a number of enamelled steel staff gauges were ordered. They were manufactured in England and only delivered in the early part of September. These gauges have been set at all stations on the Grand River and at the better class of stations on the other rivers. Gauges will not be set at the low class stations until every reasonable means have been employed to improve or supersede them.

Gauge recorders taking daily readings of water level are at present employed on the Grand, Maitland, and Severn Rivers only, but it is the intention to increase the staff of recorders now that permanent gauges have been established at the better class of stations, and the number will be increased if means can be found to protect the poor stations from backwater and provide more stable control. In the meantime, it is to be understood that the tabulated discharges for these stations indicate with a sufficient degree of accuracy the actual volume of water passing at the time of measurement from month to month, and they have a certain definite value on this account.

STREAM FLOW DATA

BLACK RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run off in sec. ft. per sq. mile.	Remarks.
Washago	Aug. 1, 1913....	18.80	124	.21	(a) Stream held back for log drive.
"	Sept, 3, 1913....	18.40	45	.08	
"	Oct. 2, 1913....	17.90	3 (a)	....	

BLANCHE RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run off in sec. ft. per sq. mile.	Remarks.
Englehart	Aug. 1, 1911....	....	461	2.00	
"	Aug. 31, 1911....	....	233	1.00	
"	Oct. 11, 1911....	....	147	.64	
"	Jan. 11, 1912....	....	191	.83	
"	Mar. 7, 1912....	....	122	.53	
"	Mar. 30, 1912....	....	161	.70	

BOYNE RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run off in sec. ft. per sq. mile.	Remarks.
Alliston	June 11, 1912....	....	66	.85	(a) Estimated. No velocity for metering.
"	July 6, 1912....	....	12 (a)	....	
"	Aug. 9, 1912....	....	66	.86	
"	Sept. 13, 1912....	....	27	.36	
"	Oct. 13, 1912....	....	50	.65	

CREDIT RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run off in sec. ft. per sq. mile.	Remarks.
Cataract Jct.......	June 24, 1912....	10.15	52	.57	(a) Water rose during time of measurement.
"	July 22, 1912....	10.30	67	.73	
"	Aug. 29, 1912....	10.20	54	.59	
"	Aug. 29, 1912....	10.30	76 (a)	.84	10 a.m.
"	Sept. 30, 1912....	10.40	87	.96	5 p.m.
"	Sept. 30, 1912....	10.50	98	1.07	10 a.m.
"	Oct. 31, 1912....	10.20	53	.59	6 p.m.
"	Oct. 31, 1912....	10.40	90	.99	10 a.m.
"	Nov. 23, 1912....	10.50	97	1.06	7.30 p.m.
"	Dec. 30, 1912....	10.40	86	.94	(b) Backwater due to construction of dam.
"	Jan. 30, 1913....	11.10	200	2.19	
"	Feb. 28, 1913....	10.04	84	.92	
"	Mar. 29, 1913....	11.50	230	2.52	
"	Apr. 30, 1913....	10.80	171	1.87	
"	May 26, 1913....	10.60	108	1.18	
"	June 25, 1913....	10.20	53	.58	
"	July 25, 1913....	10.10	41	.45	
"	Aug. 31, 1913....	10.10	35 (b)	.38	
"	Oct. 3, 1913....	10.20	42 (b)	.46	

GULL RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run off in sec. ft. per sq. mile.	Remarks.
Minden	July 27, 1911....	....	532	1.33	(a) Possibly in error
"	Sept. 6, 1911....	....	546	1.36	Note.—This river regulated by artificial storage for Trent Valley Canal.
"	Oct. 9. 1911....	4.9 (a)	642	1.60	
"	Nov. 3, 1911....	4.2	448	1.12	
"	Dec. 9, 1911....	5.45	696	1.74	
"	Jan. 10, 1912....	4.9	569	1.42	
"	Feb. 9, 1912 ...	4.1 (a)	410	1.02	
"	Mar. 8, 1912....	3.8 (a)	405	1.01	
"	Apr. 15, 1912....	6.6	1,124	2.81	
"	May 15, 1912....	7.3	1,613	4.03	
"	June 13, 1912....	5.7	780	1.95	
"	July 15, 1912....	7.0	1,561	3.90	

MAGANETAWAN RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run off in sec. ft. per sq. mile.	Remarks.
Katrine (a)....	June 15, 1912....	....	473	3.13	(a) Above Doe Lake
"	July 4, 1912....	....	192	1.27	
"	Aug. 3, 1912....	....	105	.69	
"	Sept. 5, 1912....	....	107	.71	
"	Oct. 7, 1912....	....	132	.87	
"	Nov. 8, 1912....	....	418	2.76	
"	Dec. 5, 1912....	....	583	3.85	
"	Jan. 9, 1913....	....	227	1.50	
"	Feb. 5, 1913....	....	300	1.98	
"	Mar. 9, 1913....	....	205	1.35	
"	Apr. 8, 1913....	....	1,415	9.35	
"	May 6, 1913....	....	817	5.39	
"	June 5, 1913....	....	358	2.36	
"	July 3, 1913....	....	77	.61	
"	Aug. 1, 1913....	....	59	.39	
"	Sept. 4, 1913....	....	64	.42	
"	Oct. 15, 1913....	....	89	.59	
Burk's Falls ..	June 14, 1912....	....	1,504	4.18	
"	July 5, 1912....	....	340	.94	
"	Aug. 4, 1912....	....	240	.67	
"	Sept. 6, 1912....	....	251	.69	
"	Oct. 5, 1912....	....	330	.91	
"	Nov. 8, 1912....	....	1,047	2.90	
"	Dec. 5, 1912....	....	865	2.40	
"	Jan. 9, 1913....	....	675	1.87	
"	Feb. 5, 1913....	....	745	2.06	
"	Mar. 10, 1913....	....	639	1.77	
"	Apr. 6, 1913....	....	2,403	6.65	
"	May 6, 1913....	....	1,122	3.11	
"	June 5, 1913....	....	716	1.09	
"	July 3, 1913....	....	353	.98	
"	Aug. 21, 1913....	....	211	.58	
"	Sept. 5, 1913....	....	193	.53	
"	Oct. 16, 1913....	....	260	.72	
Byng Inlet (a).	Oct. 10, 1912....	....	391	....	(a) Measured at one outlet only.
"	Nov. 11, 1912....	....	1,053	....	
"	Dec. 12, 1912....	....	2,044	....	
"	Jan. 13, 1913....	....	965	....	
"	Feb. 10, 1913....	....	965	....	
"	Mar. 14, 1913....	....	827	....	
"	July 8, 1913....	....	1,311	....	
"	Aug. 12, 1913....	....	535	....	
"	Sep. 10, 191	....	(b)	....	(b) No flow.

MISSISSAGA RIVER

Mississaga (a)	July 7, 1913....	....	4,395	(b)	(a) This station seriously affected by wind levels on Lake Huron, which cause back-water at point of measurement. (b) Watershed not surveyed.
"	Aug. 9, 1913....	....	3,343	"	
"	Sep. 9, 1913....	....	1,282	"	
"	Oct. 20, 1913....	....	2,526	"	

MUSKOKA RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
High Falls (a)	Sep. 8, 1911....	....	124	.13	(a) North Branch, above Bracebridge.
"	Sep. 26, 1911....	....	123	.13	
"	Sep. 26, 1911....	....	104 (b)	.11	(b) Below Port Sydney.
"	June 6, 1912....	....	2,828	2.91	
"	July 3, 1912....	....	150	.15	
"	Aug. 2, 1912....	....	193	.20	
"	Sep. 4, 1912....	....	215	.22	
"	Oct. 4, 1912....	....	391	.40	
"	Nov. 6, 1912....	23.70	1,139	1.18	
"	Dec. 4, 1912....	25.20	3,242	3.36	
"	Jan. 8, 1913....	23.80	1,141	1.18	
"	Feb. 4, 1913....	24.20	1,561	1.62	
"	Mar. 7, 1913....	24.00	1,268	1.31	
"	April 6, 1913....	27.00	6,608	6.85	
"	May 6, 1913....	24.60	2,367	2.46	
"	June 4, 1913....	23.60	847	.88	
"	July 2, 1913....	22.50(c)	200	.21	(c) Back-water due to construction work.
"	Aug. 1, 1913....	22.30	318	.33	
"	Sep. 4, 1013....	22.10	235	.24	
"	Oct. 14, 1913....	22.70(c)	171	.18	
South Falls (d)....	Sep. 9, 1911....	....	303	.39	
"	Sep. 27, 1911....	....	271	.35	(d) South Branch above Bracebridge.
Trethewey's Falls..	Aug. 2, 1912....	16.60	1,337 (e)	2.03	
"	Sep. 4, 1912....	13.30	349	.53	(e) Log drive raised water 3 ft. in a few hours.
"	Oct. 5, 1912....	13.50	414	.63	
"	Nov. 6, 1912....	14.50	1,258	1.91	
"	Dec. 4, 1912....	16.50	1,232	1.87	
"	Jan. 8, 1913....	14.70	1,096	1.67	
"	Feb. 4, 1913....	15.50	1,262	1.92	
"	Mar. 8, 1913....	15.10	1,248	1.9	
"	April 7, 1913....	19.00	7,312	11.11	
"	May 6, 1913....	16.90	2,175	3.31	
"	June 4, 1913....	14.30	350	.53	
"	July 2, 1913....	13.50	408	.62	
"	Aug. 1, 1913....	15.20	1,324	2.01	
"	Sep. 3, 1913....	12.60	292	.44	
"	Oct. 14, 1913....	12.30	204	.31	
Bala (f)	Oct. 12, 1912....	....	1,663	....	(f) Below Muskoka Lake, artificially controlled by dam at Bala.
"	Nov. 14, 1912....	....	5,797	....	
"	Dec. 12, 1912....	....	6,732	....	
"	Jan. 14, 1913....	....	2,646	....	
"	Feb. 12, 1913....	....	3,263	....	
"	Mar. 15, 1913....	....	3,748	....	
"	Apl. 12, 1913....	....	13,576	....	
"	May 9, 1913....	....	6,377	....	
"	June 11, 1913....	....	818	....	(g) Dam closed during construction of new dam and bridge, June to November.
"	July 9, 1913....	....	150 (g)	....	
"	Aug. 13, 1913....	....	484 (g)	....	
"	Sep. 12, 1913....	....	57 (g)	....	
"	Oct. 22, 1913....	....	22 (g)	....	

NOTTAWASAGA RIVER

Nicholson (a)......	June 11, 1912....	7.00	426	1.31	(a) Station at McLean's bridge.
"	July 6, 1912....	5.61	197	.61	
"	Aug. 9, 1912....	5.60	190	.58	
"	Sep. 12, 1912....	5.54	156	.48	
"	Oct. 13, 1912....	6.42	260	.80	
"	Nov. 15, 1912....	11.02	1,580	4.86	
"	Dec. 13, 1912....	6.72	352	1.08	

NOTTAWASAGA RIVER.—Continued.

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
Nicholson........	Jan. 15, 1913....	7.02	481	1.48	
"	Feb. 13, 1913....	6.02	241	.74	
"	Mar. 16, 1913....	17.02	2,416	7.43	
"	Apl. 12, 1913....	10.02	1,261	3.88	
"	May 10, 1913....	6.22	355	1.09	
"	June 11, 1913....	5.70	223	.69	
"	July 9. 1913....	5.50	139	.43	
"	Aug. 13, 1913....	5.30	89	.27	
"	Sep. 12, 1913....	5.50	131	.40	
"	Oct. 22, 1913....	6.00	209	.64	

ROUGE CREEK

Markham	May 14, 1912	....	24 (a)	.36	(a) Below Reesor's dam.
"	May 14, 1912	....	23 (b)	.36	
"	June 21, 1912	....	23 (a)	.36	(b) Above Milne's dam.
"	July 16, 1912	....	7 (a)	.10	
"	Aug. 17, 1912	....	11 (a)	.16	Note.—Volume of flow governed by operation of mills up stream.
"	Sep. 14, 1912	....	43 (a)	.66	
"	Oct. 14, 1912	....	69 (a)	1.06	

SAUGEEN RIVER

Port Elgin........	July 7, 1911....	4.65	491	.31	(a) Error in gauge reading evident.
"	Aug. 17, 1911....	4.55	399	.25	
"	Sep. 20, 1911....	4.65	506	.32	
"	Oct. 13, 1911....	5.10	692	.44	(b) Gauge heights not reliable owing to ice conditions.
"	Nov. 17, 1911....	(a)	4,704	3.01	
"	Dec. 20, 1911....	(b)	1,473	.94	
"	Jan. 25, 1912....	(b)	2,308	1.40	
"	Feb. 24, 1912....	5.30 (b)	876	.56	(c) Gauge height 20.0 on April 8, 1912, at peak of flood.
"	Mar. 27, 1912....	7.00	1,922	1.23	
"	Apr. 10. 1912....	13.80	19,436 (c)	12.45	
"	Apr. 25, 1912....	8.20	4,028	2.58	
"	May. 29, 1912....	8.20	4,323	2.77	
"	June 26, 1912....	5.70	1,066	.68	
"	July 23, 1912....	5.70	1,116	.71	
"	Aug. 25, 1912....	6.10	1,482	.95	
"	Sep. 25, 1912....	6.50	1,965	1.26	
"	Oct. 27, 1912....	6.1	1,502	.96	
"	Nov. 26, 1912....	7.20	2,883	1.84	
"	Dec. 21, 1912....	7.20	2,881	1.84	
"	Jan. 25, 1913....	10.00	6,273	4.00	
"	Feb. 23, 1913....	(b)	2,816	1.80	
"	Mar. 23, 1913....	12.00	10,596	6.77	
"	Apr. 21, 1913....	7.40	2,341	1.50	
"	May 21, 1913....	6.00	1,416	.90	
"	June 16, 1913....	5.28	920	59	
"	July 15, 1913....	5.10	663	.42	
"	Aug. 19, 1913....	4.50	361	.23	
"	Sep. 23, 1913....	4.60	386	.25	
"	Oct. 27, 1913....	5.75	897	.57	
Walkerton	June 26, 1912....	15.65	679	.76	
"	July 23, 1912....	15.80	734	.82	
"	Aug. 23, 1912....	16.00	806	.90	
"	Sep. 26, 1912....	16.00	812	.91	
"	Oct. 25, 1912....	16.00	814	.91	
"	Nov. 25, 1912....	17.00	1,492	1.67	

SAUGEEN RIVER—Continued.

Station	Date of measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
Walkerton	Dec. 21, 1912....	16.80	1,280	1.43	
"	Jan. 24, 1913....	20.25	4,696	5.24	
"	Feb. 21, 1913....	17.25	1,720	1.92	
"	Mar. 22, 1913....	24.25	8,836	9.87	
"	Apr. 22, 1913....	17.25	1,724	1.93	
"	May 20, 1913....	16.10	897	1.00	
"	June 17, 1913....	15.65	483	.54	
"	July 16, 1913....	15.20	294	.33	
"	Aug. 20, 1913....	15.00	251	.28	
"	Sep. 24, 1913....	15.20	347	.39	
"	Oct. 28, 1913....	15.70	563	.63	
Chesley	July 17, 1911....	3.95	164	1.82	(a) Gauge height measured in heavy wind.
"	Aug. 16, 1911....	3.85	140	1.56	
"	Sept. 13, 1911....	4.00	168	1.86	
"	Oct. 13, 1911....	4.20	174	1.94	(b) Gauge height 8.2 on April 8, 1912.
"	Nov. 7, 1911....	4.20 (a)	185	2.06	
"	Dec. 19, 1911....	4.20	181	2.01	(c) Mill above closed for 2½ days.
"	Jan. 24, 1912....	4.20	180	2.00	
"	Feb. 21, 1912....	4.20	179	2.00	
"	Mar. 26, 1912....	4.50	233	2.56	NOTE.—Volume of flow governed by operation of mills up stream.
"	Apr. 11, 1912....	7.50	2,151 (b)	23.89	
"	Apr. 24, 1912....	....	369	4.10	
"	May 28, 1912....	4.50	236	2.62	
"	June 25, 1912....	3.85	182	2.02	5.15 p.m.
"	June 25, 1912....	3.40	100	1.11	7.15 p.m.
"	July 24, 1912....	3.80	168	1.86	4.00 p.m.
"	July 24, 1912....	3.30	102	1.13	7.35 p.m.
"	Aug. 23, 1912....	3.30	96	1.07	10.30 p.m.
"	Aug. 24, 1912....	3.75	169	1.87	10.30 p.m.
"	Sept. 25, 1912....	3.50	118	1.31	5.00 p.m.
"	Sept. 25, 1912....	3.20	78	0.859	7.00 p.m.
"	Oct. 28, 1912....	3.50	121 (c)	1.35	

SEGUIN RIVER

Parry Sound......	June 8, 1912....	11.10	1,406	3.87	NOTE.—Gauge heights affected by back-water from Mill Lake dam.
"	July 5, 1912....	9.00	293	.81	
"	Aug. 8, 1912....	8.00	189	.52	
"	Sept. 11, 1912....	8.40	244	.67	
"	Oct. 11, 1912....	6.20	121	.33	
"	Nov. 12, 1912....	10.70	1,034	2.85	
"	Dec. 12, 1912....	12.50	2,283	6.29	
"	Jan. 13, 1913....	10.70	1,016	2.80	
"	Feb. 11, 1913....	11.50	710	1.95	
"	Mar. 14, 1913....	10.80	700	1.93	
"	Apr. 11, 1913....	12.80	2,849	7.85	
"	May 9, 1913....	11.60	700	1.93	
"	June 10, 1913....	11.50	299	.82	
"	July 8, 1913....	8.20	82	.23	
"	Aug. 12, 1913....	5.20	168	.46	
"	Sept. 10, 1913....	5.30	139	.38	
"	Oct. 21, 1913....	5.20	197	.54	

SOUTH RIVER

Station.	Date of Measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
Powassan........	Mar. 19, 1912....	....	136	.42	
"	Apr. 1, 1912....	....	231	.72	
"	June 7, 1912....	28.30	1,091	3.40	
"	July 4, 1912....	24.40	174	.54	
"	Aug. 5, 1912....	24.50	214	.67	
"	Sept. 7, 1912....	24.50	213	.67	
"	Oct. 7, 1912....	24.60	265	.82	
"	Nov. 9, 1912....	28.90	1,346	4.19	
"	Dec. 6, 1912....	28.80	1,262	3.92	(a) Debris in stream.
"	Jan. 10, 1913....	24.60	266	.83	
"	Feb. 6, 1913....	24.20	167	.52	
"	Mar. 11, 1913....	24.00	131	.41	
"	Apr. 8, 1913....	30.20	2,021	6.27	
"	May 7, 1913....	26.00	962	2.99	
"	June 6, 1913....	26.00	592	1.84	
"	July 4, 1913....	23.70	82	.25	
"	Aug. 4, 1913....	23.90	69 (a)	.21	
"	Sept. 5, 1913....	23.80	96	.30	
"	Oct. 15, 1913....	24.50	141 (a)	.44	

SPANISH RIVER

Nairn	Aug. 8, 1913....	....	1,717	.37	
"	Sept. 9, 1913....	....	1,124	.25	
"	Oct. 18, 1913....	....	2,186	.48	

STURGEON RIVER

Sandy Falls	Aug. 5, 1912....	33.80(a)	1,869	.85	(a) Gauge heights affected by backwater.
"	Sept. 9, 1912....	33.30	1,543	.70	
"	Oct. 8, 1912....	33.80	1,800	.82	
"	Nov. 10, 1912....	34.70	3,042	1.38	
"	Dec. 7, 1912....	34.00	2,060	.94	
"	Jan. 11, 1913....	33.60	1,843	.84	
"	Feb. 7, 1913....	32.30	1,259	.57	
"	Mar. 12, 1913....	32.10	1,121	.51	
"	Apr. 19, 1913....	36.00	5,233	2.38	
"	May 1913....	40.60	(b)	....	(b) No measurement. Logs in stream.
"	June 7, 1913....	36.60	6,129	2.78	
"	July 6, 1913....	35.20	2,135	.97	
"	Aug. 6, 1913....	33.60	1,594	.72	
"	Sept. 7, 1913....	33.20	856	.39	
"	Oct. 16. 1913....	33.50	1,148	.52	

TEESWATER RIVER

Paisley	Oct. 26, 1912....	18.00	248	1.93	
"	Nov. 26, 1912....	18.93	662	2.92	
"	Dec. 21, 1912....	18.93	665	2.93	
"	Jan. 24, 1913....	22.30	1,813	7.99	
"	Feb. 22, 1913....	19.70	866	3.82	
"	Mar. 24, 1913....	25.60	3,380	14.89	
"	Apr. 22, 1913....	18.90	661	2.92	
"	May 20, 1913....	17.90	266	1.17	
"	June 17, 1913....	17.10	84	.37	
"	July 16, 1913....	17.30	194	.85	
"	Aug. 20, 1913....	16.80	29 (a)	.13	(a) Mill closed.
"	Sept. 24, 1913....	16.80	137	.60	
"	Oct. 28, 1913....	17.50	266	1.17	

THAMES RIVER

Station.	Date of measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
London (a)........	Mar. 12, 1912....	....	284	.23	(a) On main stream.
"	June 29, 1912....	5.98	250	.20	
"	July 26, 1912....	5.90	195	.15	
"	Aug. 27, 1912....	6.30	435	.34	Heavy rains.
"	Sept. 27, 1912....	6.90	994	.78	
"	Oct. 30, 1912....	6.40	596	.47	
"	Nov. 28, 1912....	6.90	996	.79	
"	Dec. 29, 1912....	6.40	606	.48	
"	Jan. 27, 1913....	9.50	4,431	3.49	
"	Feb. 26, 1913....	6.90	822	.65	
"	Mar. 27, 1913....	12.00	9,641	7.58	
"	Apr. 24, 1913....	9.40	4,750	3.74	
"	May 23, 1913....	6.30	487	.78	
"	June 19, 1913....	6.20	261	.21	
"	July 18, 1913....	5.90	202	.16	
"	Aug. 22, 1913....	6.20	322	.25	
"	Sept. 26, 1913....	5.95	206	.16	
"	Oct. 30, 1913....	6.22	363	.29	
London (b)........	July 18, 1913....	11.10	37	.03	(b) North Branch.
"	Aug. 22, 1913....	11.4	132	.10	
"	Sept. 26, 1913....	10.7	12	.01	
"	Oct. 30, 1913....	11.17	45	.04	
London (c)........	July 18, 1913....	21.20	74	.06	(c) South Branch.
"	Aug. 22, 1913....	21.30	67	.05	
"	Sept. 26, 1913....	20.90	21	.02	
"	Oct. 30, 1913....	21.45	249	.20	

VERMILION RIVER

White Fish........	Aug. 7, 1913....	27.40	773	.41	
"	Sept. 8, 1913....	26.80	325	.17	
"	Oct. 18, 1913....	27.20	559	.29	

WAHNAPITAE RIVER

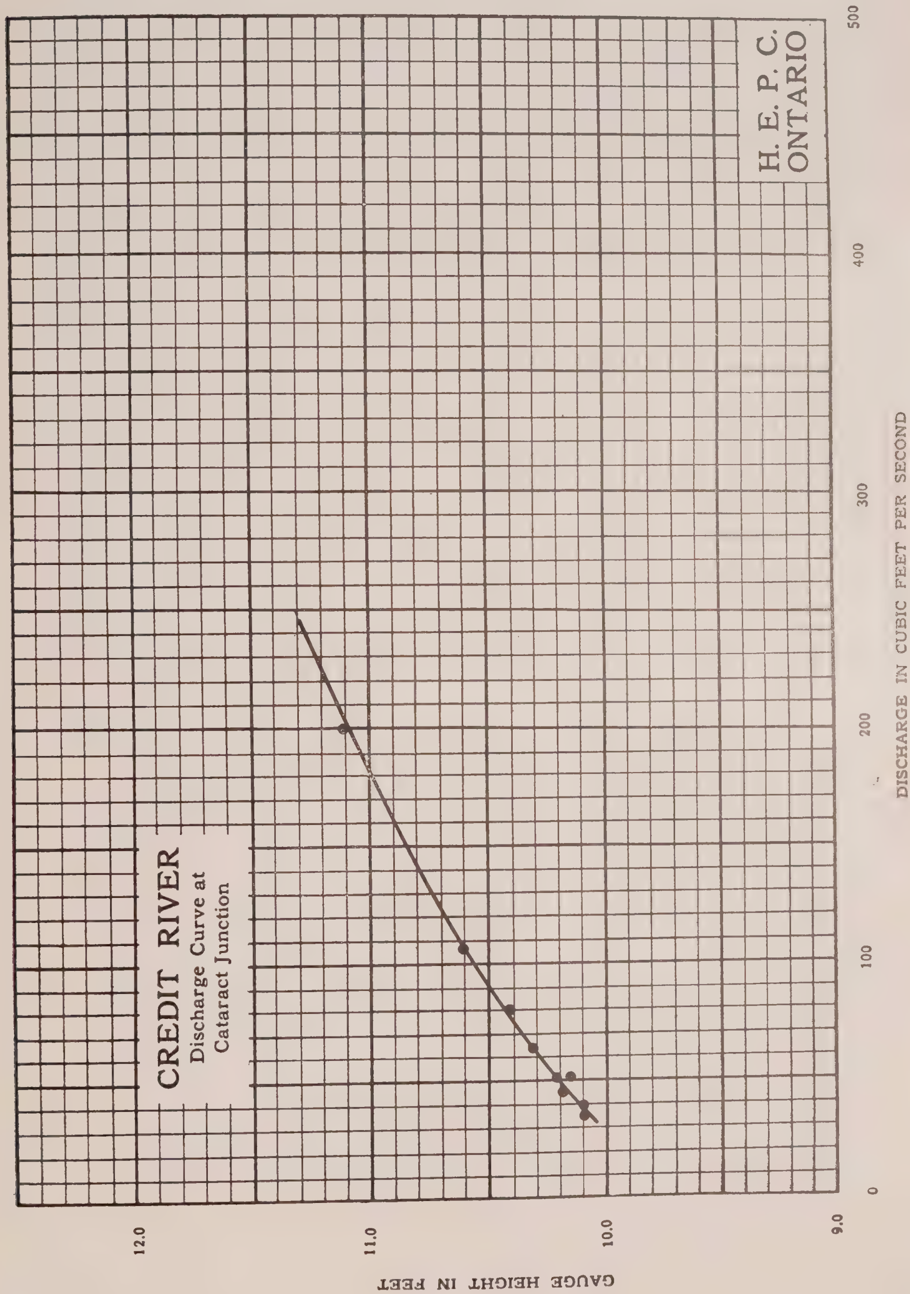
Wahnapitae........	Jan. 23, 1906....	....	826	0.91	
"	Aug. 7, 1912....	....	1,807	1.98	
"	Sept. 10, 1912....	....	1,983	2.18	
"	Oct. 9, 1912....	....	1,794	1.97	
"	Nov. 11, 1912....	....	1,908	2.10	
"	Dec. 9, 1912....	....	1,887	2.08	
"	Jan. 12, 1913....	....	1,776	1.95	
"	Feb. 9, 1913....	....	1,329	1.46	
"	Mar. 13, 1913....	....	1,553	1.71	
"	Apr. 20, 1913....	....	(a)	....	(a) Ice unsafe. No measurement taken.
"	May 8, 1913....	....	5,239	5.75	
"	June 9, 1913....	....	2,915	3.20	
"	July 5, 1913....	....	1,408	1.55	
"	Aug. 11, 1913....	....	982	1.08	
"	Sept. 6, 1913....	....	1,200	1.32	
"	Oct. 17, 1913....	....	977	1.06	

MISCELLANEOUS MEASUREMENTS

River.	Date.	Discharge in sec. ft.	Location.
Abitibi	Oct. 23, 1911	5,487	At Iroquois Falls.
"	Feb. 2, 1912	3,026	At Couchiching Falls.
"	Mar. 12, 1913	1,743	Above Iroquois Falls.
"	Mar. 13, 1913	2,493	¾ mile above Black River.
Black (Nipissing)	Mar. 26, 1913	248	Above McDougall's Chutes.
Bonnechere	Oct. 4, 1913	117	Round Lake Dam.
"	Oct. 6, 1913	106	Golden Lake.
Driftwood	Mar. 22, 1911	39	Monteith.
English	May 26, 1906	6,740	Pelican Falls.
"	June 2, 1906	6,702	Manitou Rapids.
Kaministiquia	Aug. 12, 1905	2,737	Fort William.
"	Sep. 6, 1905	2,091	Tonkin's Farm.
"	Sep. 8, 1905	882	Silver Falls.
"	Feb. 3, 1906	1,100	Kakabeka Falls.
"	Jan. 28, 1906	662	Silver Falls.
"	Mar. 10, 1906	880	Kakabeka Falls.
"	Mar. 6, 1906	494	Silver Falls.
"	Oct. 6, 1906	1,355	Tonkin's Farm.
Kawa Kash Kagama	Sep. 20, 1906	159	Howard's Falls.
Kapuskasing	Sep. 20, 1911	679	Loon Falls.
"	Sep. 21, 1911	713	Lapenagam Falls.
"	Sep. 23, 1911	1,074	Wendega Falls.
"	Sep. 24, 1911	967	Kabohose Falls.
"	Oct. 26, 1911	933	Weiswinin Falls.
"	Feb. 28, 1912	613	Sesebegagan Falls.
"	Feb. 29, 1912	686	Weiswinin Falls.
Mettagami	Mar. 25, 1912	633	Sandy Bay Falls.
"	Mar. 27, 1912	415	Wawiatan Falls.
"	Mar. 16, 1913	195	" "
"	Mar. 29, 1913	240	" "
"	Mar. 30, 1913	232	" "
"	Mar. 30, 1913	207	" "
"	Mar. 30, 1913	218	" "
"	July 15, 1911	792	
"	July 11, 1911	921	Kenogamisse Falls.
"	Feb. 7, 1912	1,421	Smooth Rock Falls.
"	Jan. 24, 1912	1,608	Sturgeon Falls.
Madawaska	Oct. 3, 1913	692	Below Calabogie.
Mississippi	Oct. 2, 1913	196	Snow Road.
Missanaibi	Aug. 21, 1911	561	St. Paul's Falls.
"	Aug. 24, 1911	1,107	Pond Falls.
"	Aug. 26, 1911	1,756	Sandy Bay, Glass Falls.
"	Mar. 3, 1912	736	Glass Falls.
Montreal	Jan. 8, 1908	930	Gillies Siding.
Moira	Oct. 25, 1905	700	Belleville.
"	Nov. 8, 1905	590	"
"	Dec. 5, 1905	946	"
Nepigon	Sep. 15, 1905	8,924	Pine Portage.
"	Nov. 3, 1905	7,014	Cameron's Pool.
"	Feb. 9, 1906	5,982	"
"	Mar. 23, 1906	5,879	"
"	Sep. 30, 1906	5,884	"
North-West	Sep. 13, 1912	256	Foot Print Lake.
Onaping	Jan. 1906	254	High Falls.
Pic	Aug. 5, 1906	154	Lake Superior Portage.
Rainy	Oct. 25, 1905	14,145	Fort Frances.
"	Apr. 1, 1906	6,805	"
"	Sep. 26, 1910	5,229	"
Severn	Aug. 22, 1906	1,206	Big Chute.
"	Nov. 9, 1905	1,503	"
Sturgeon (Nipissing)	Jan. 19, 1906	1,230	Smoky Falls.
Sturgeon (Thunder Bay)	July 26, 1906	251	Beaver Falls.
Seine	July 9, 1906	1,842	Island Falls.

MISCELLANEOUS MEASUREMENTS — Concluded.

River.	Date.	Discharge in sec. ft.	Location.
Trent	Oct. 16, 1905	2,200	Trenton.
"	Oct. 25, 1905	2,406	"
"	Nov. 7, 1905	2,196	"
"	Nov. 16, 1905	2,090	Healey Falls.
Vermillion	Jan. 1906	791	Wabageshik Chute.
Wabigoon	Oct. 9, 1905	206	Dryden.
White Fish	Jan. 1906	207	White Fish Falls.
"		146	Below Penache Lake.
Winnipeg	Oct. 14, 1905	5,321	Eastern Outlet.
"	Apr. 8, 1906	4,490	" "
"	Oct. 16, 1905	899	L. of W. Milling Co. head-race.
"	Oct. 16, 1905	400	Keewatin Lumber Co.
"	Oct. 18, 1905	21,794	Western Outlet.
York	Oct. 7, 1913	136	Below High Falls.
"	Oct. 8, 1913	181	Below Bancroft.


CREDIT RIVER
Discharge Curve at
Cataract Junction
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
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300
400
500
GAUGE HEIGHT IN FEET
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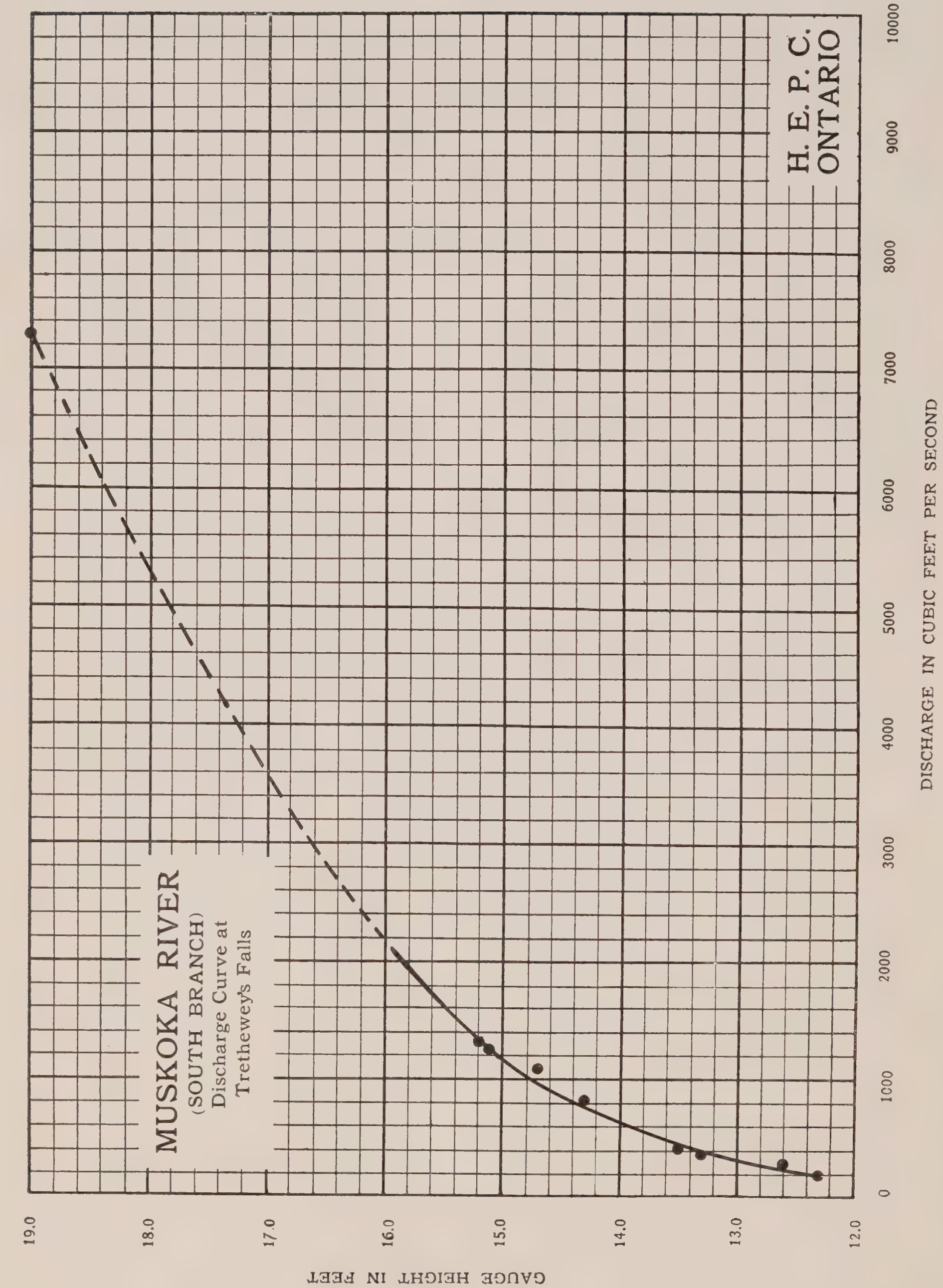
10.0
11.0
12.0


MUSKOKA RIVER
(SOUTH BRANCH)
Discharge Curve at
Trethewey's Falls
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
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GAUGE HEIGHT IN FEET
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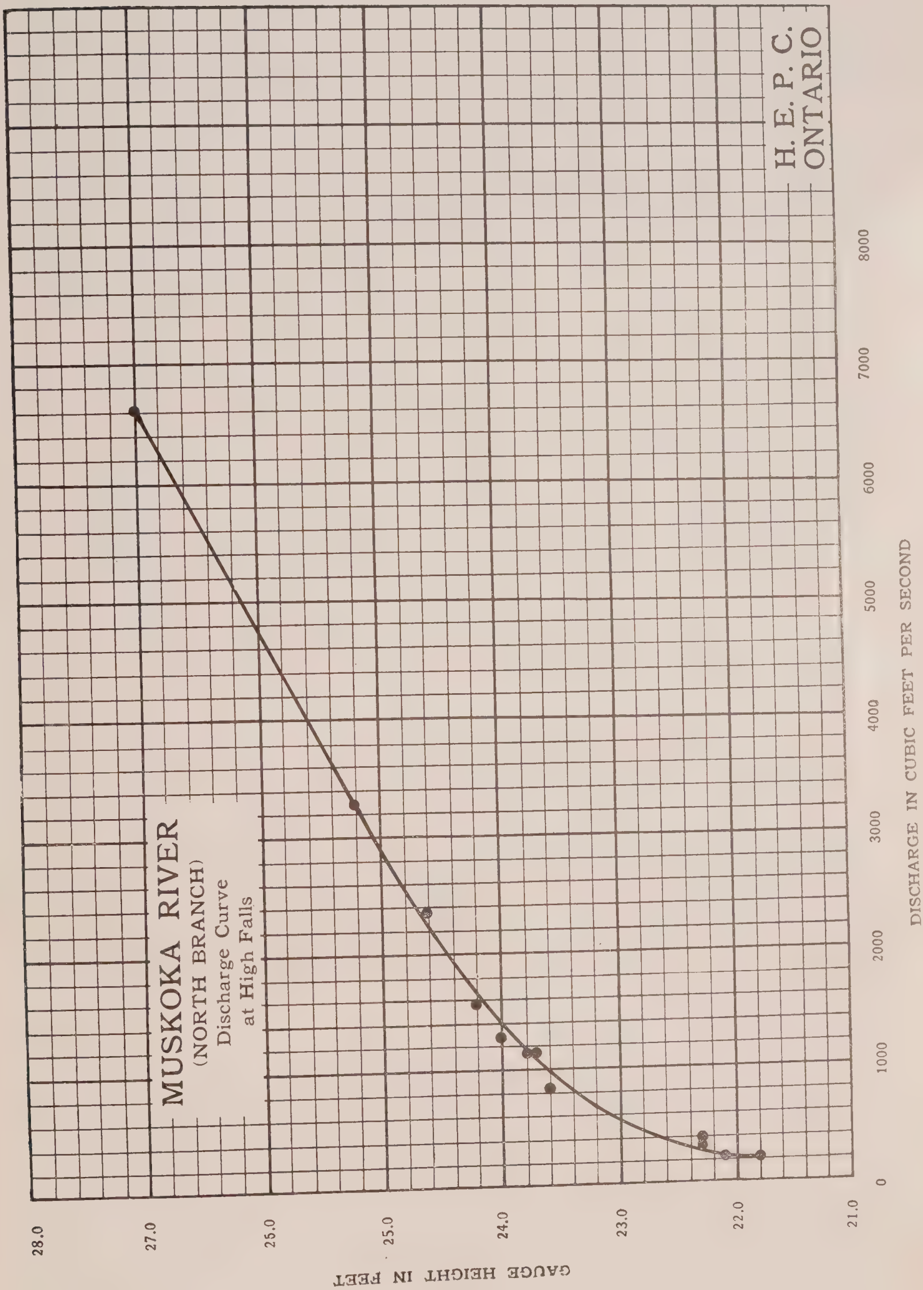
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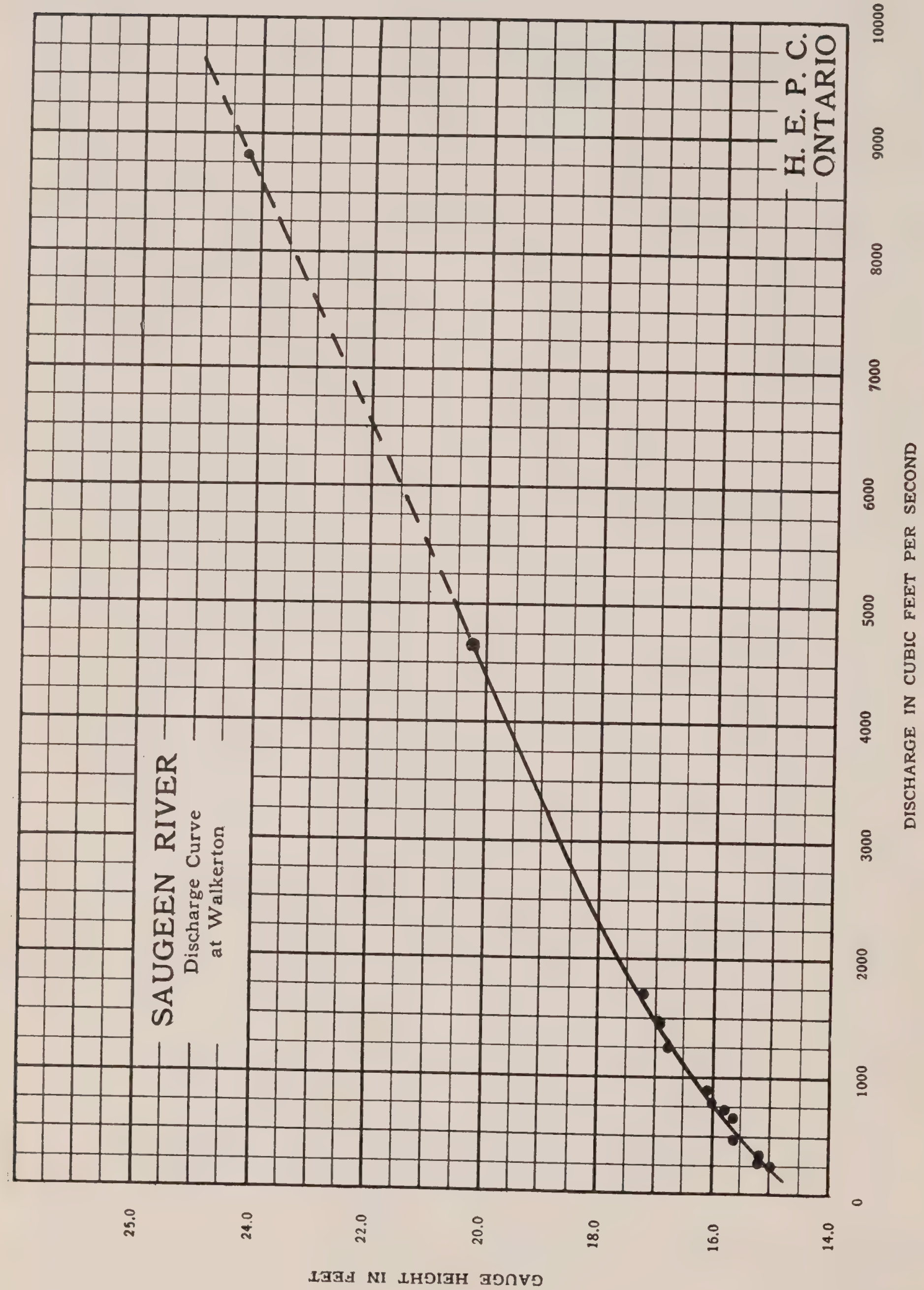
(NORTH BRANCH)
Discharge Curve
at High Falls
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
GAUGE HEIGHT IN FEET


SAUGEEN RIVER
Discharge Curve
at Walkerton
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ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
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2000
3000
4000
5000
6000
7000
8000
9000
10000
GAUGE HEIGHT IN FEET
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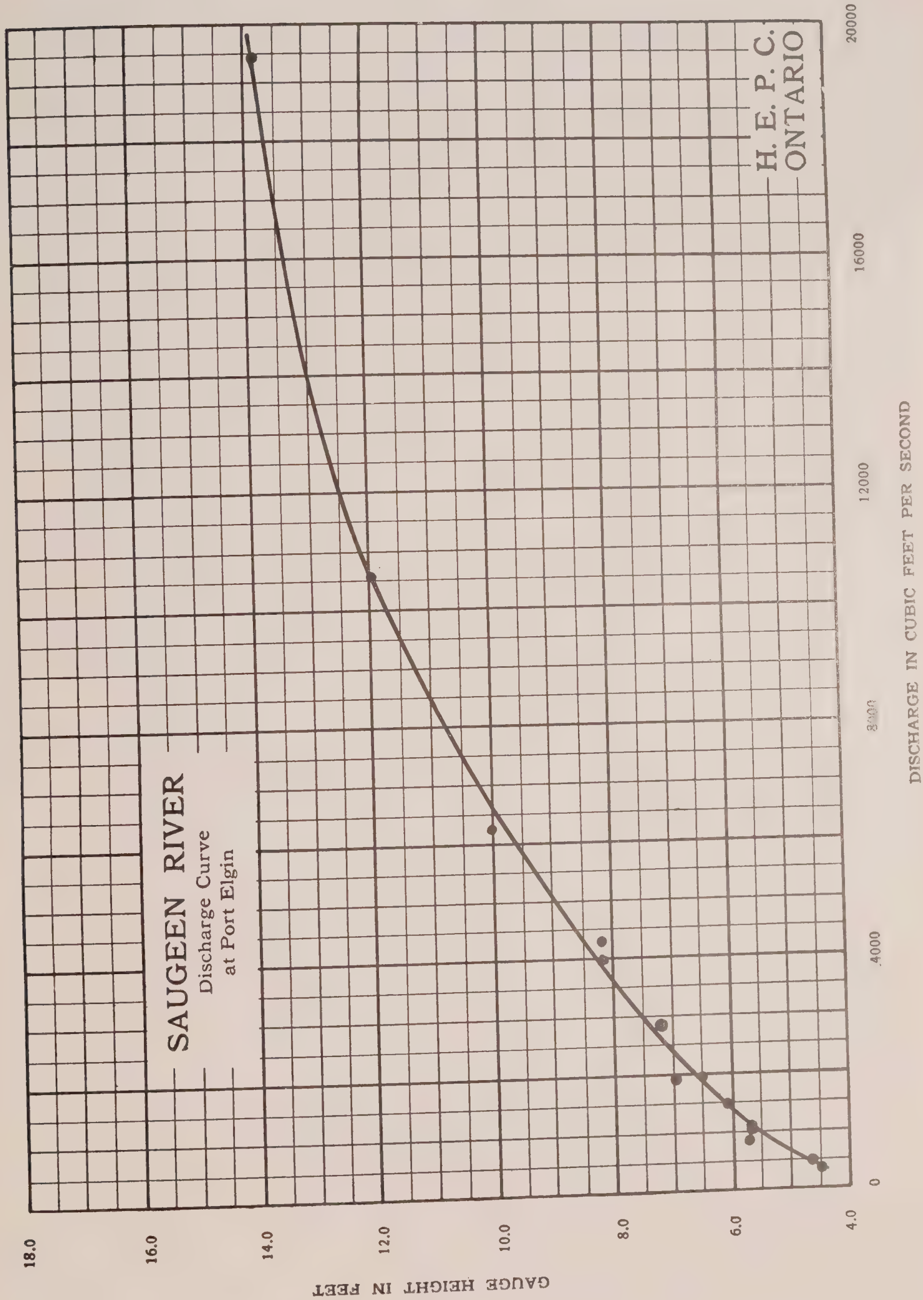
20.0
22.0
24.0
25.0


SAUGEEN RIVER
Discharge Curve
at Port Elgin
H. E. P. C.
ONTARIO
GAUGE HEIGHT IN FEET
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16.0
14.0
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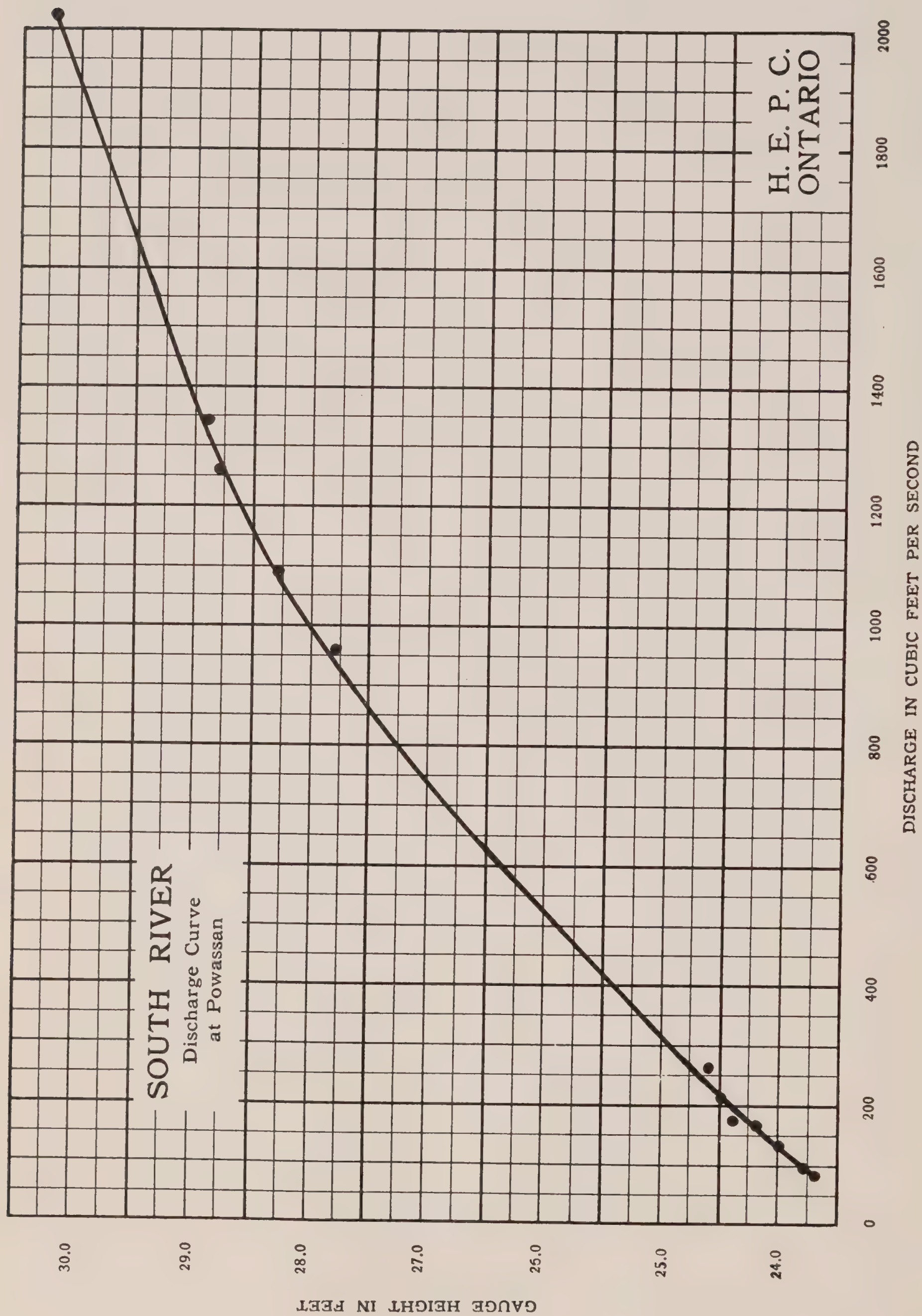
SOUTH RIVER
Discharge Curve
at Powassan
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
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200
400
600
800
1000
1200
1400
1600
1800
2000
GAUGE HEIGHT IN FEET
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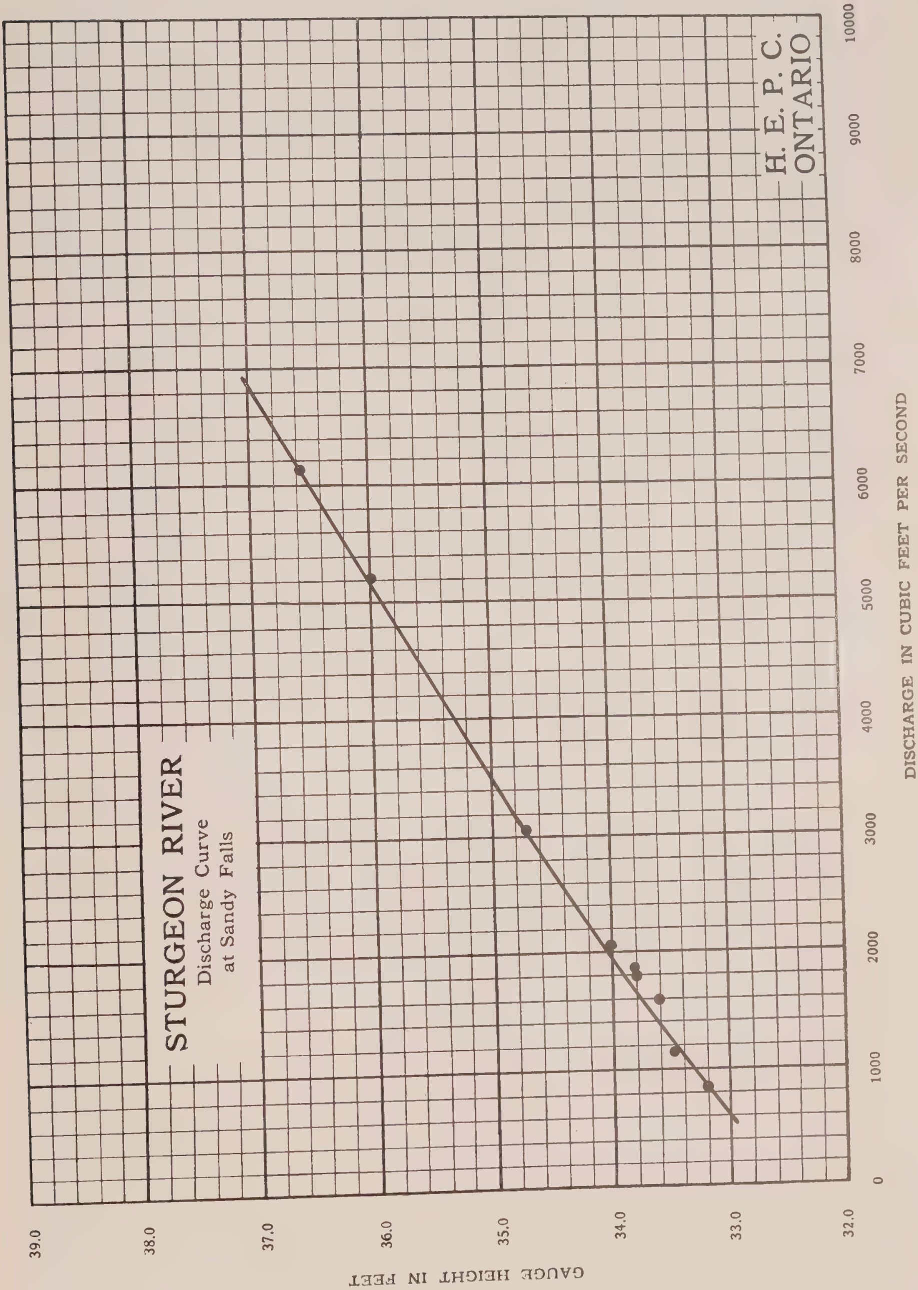
STURGEON RIVER
Discharge Curve
at Sandy Falls
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
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2000
3000
4000
5000
6000
7000
8000
9000
10000
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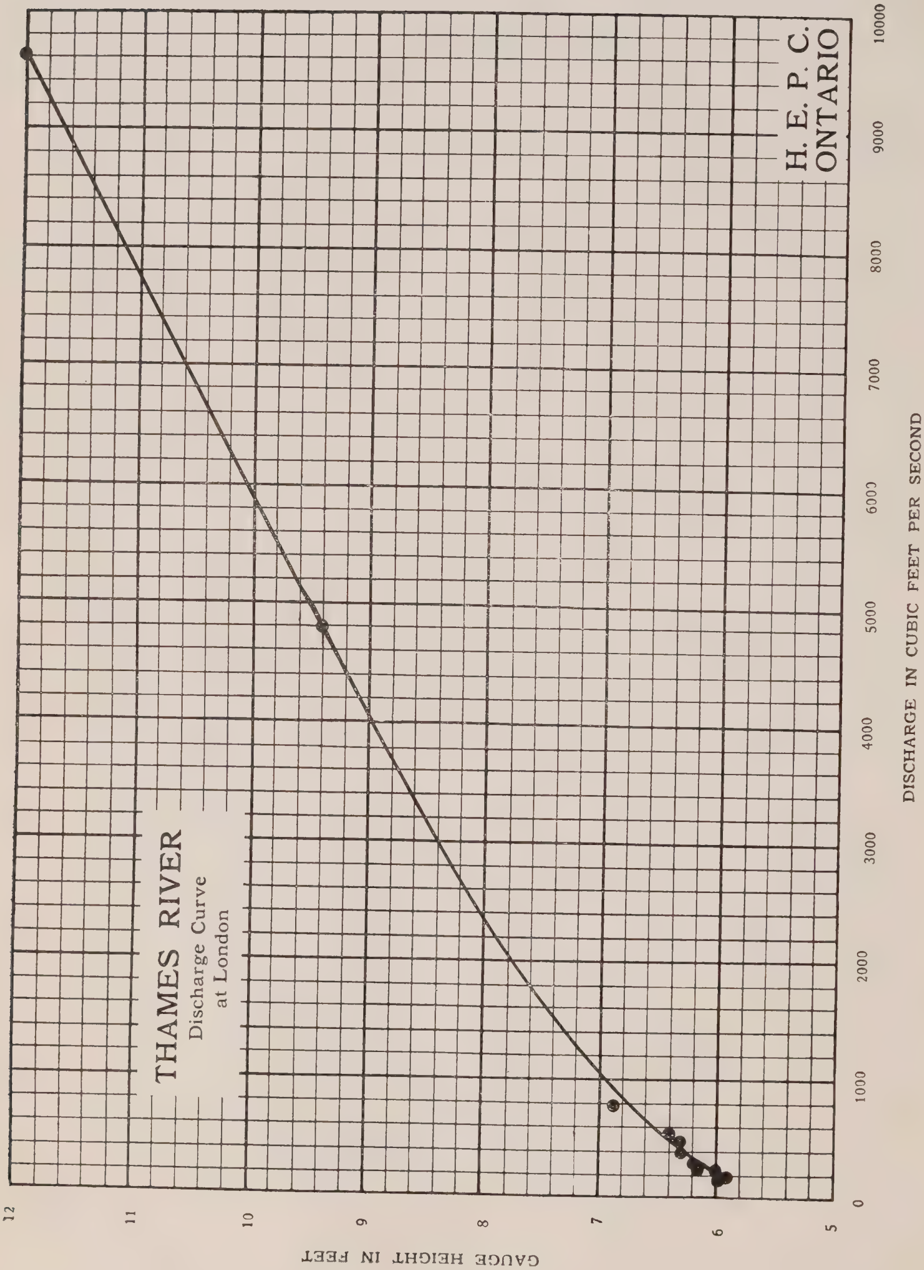
THAMES RIVER
Discharge Curve
at London
H. E. P. C.
ONTARIO
DISCHARGE IN CUBIC FEET PER SECOND
GAUGE HEIGHT IN FEET
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1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
5
6
7
8
9
10
11
12

INDEX.